School Shop

vol. XV no. 8

APRIL 1956

Industry Looks at Industrial Education

Portfolio of Articles
by Men from Industry

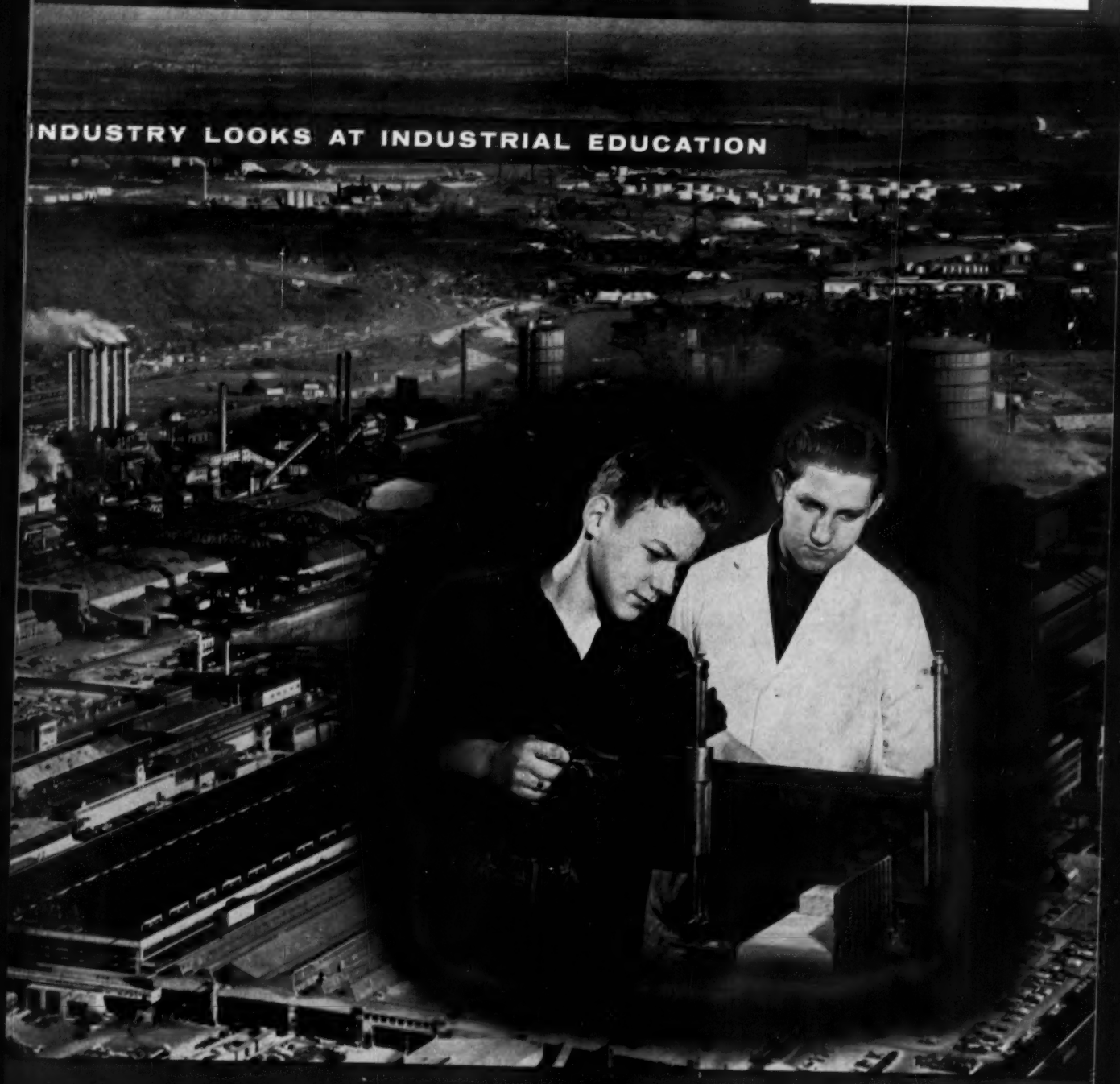
Suppliers Directory

New Instructional Materials

Directory of Officials

Cover story: Backed by a sprawling industrial plant, a student and his instructor set their sights on a career in industry for the boy, as our nation continues its great production strides. For comments by men from industry on the school-shop program, see pages 3-61. Background photo is courtesy of the Ford Motor Co.

INDUSTRY LOOKS AT INDUSTRIAL EDUCATION



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School Shop TALK

COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

How Industry Can Look at Industrial Education

An effective program of industrial education is attainable only when we have close cooperation between representatives of the school, the employer, and the worker.

One of the functions of the school is to contribute to the general education of pupils by providing them with a broad understanding of industrial materials and processes. A second function is to prepare young people for effective participation in the activities found in industry when their interests and aptitudes lie in that direction.

If these objectives are to be achieved it is important that school authorities assure themselves that what they teach in the field of industry is in keeping with modern industrial practice. In order to have this assurance it is imperative that the school have available the advice and guidance which can come only from those who are in immediate contact with industry.

With the increasing demand for skilled labor in all areas of occupational life (this note runs through all the articles in this issue of SCHOOL SHOP), both management and labor are intensely interested in what the schools are doing to augment the supply of trained personnel. If the schools are to be successful in helping to meet this demand, it is important that they have the full cooperation and support of both of these groups. They must have the opportunity to participate in the planning and operation of any program of industrial training introduced into the school curriculum.

The practice of enlisting the aid of industrial people is followed in many schools through the medium of representatives chosen from the fields of management and labor. Where these committees are functioning, the school people can rely on them for advice and guidance about the types of education suitable for their community.

Success in developing the cooperation of these committees is dependent on the extent to which the school requests and uses the suggestions they make.

Advisory committees may be either of two types. First, there may be a general committee composed of representatives from the school, the employing group, and the workers. This group can advise concerning the general policies of the school and is in a helpful position to suggest the types of occupational training needed in the community. The members can be an aid, also, in stimulating and maintaining public interest in the industrial-education program.

The second type of committee is set up to represent specific crafts. This kind of group is in a position to advise concerning the content of the courses agreed on, the length of each, the standards to be set up, and the type of equipment to be used in training for the occupations represented.

This issue is an effort on the part of SCHOOL SHOP to bring to the attention of our readers the opinions of representatives of the employers' groups. These individuals have been asked to look at the industrial-education program as it is today in our public schools—both industrial arts and trade training. On the basis of their observations, they have been asked to indicate what they think are the strengths and the weaknesses of the school program and to suggest what they think should be added to insure the greatest service to modern industry. Later it may be possible to present another issue in which the point of view of labor can be explored.

It is hoped that school people will recognize the sincerity with which the suggestions are offered and will put those into effect which have merit for their particular situation.—*T.D.*

Both Sides of the Coin

By and large the writers of the pieces in this issue treat shop teachers and the school program in a kindly manner. Nevertheless, they have definite ideas about what is lacking in skills and attitudes on the part of a sizable portion of the young people entering the labor force from the public schools.

Some of what they want will never be attained unless the biologists can soup up the Mendelian law, the sociologists can demolish environmental *cul de sacs*, and the psychologists can streamline the laws of learning. But they are pretty reasonable in their demands and are worth listening to. Many are former teachers so, having seen both sides of the coin, they are in a good position to call the results.—*L.W.P.*

What should your industrial-education program emphasize? Some current ideas are brought out as

Directors of Training for Industry View Industrial Education

By Charles V. Youmans

College of Education, University of Kentucky, Lexington

Charles V. Youmans

As an industrial-arts or vocational-industrial teacher, you have no doubt wondered how the managers of American industry feel about the industrial-education programs in the public secondary schools. A few industrial managers have spoken out; some have been critical, others have praised these programs. Some schools have made periodic surveys to determine the reaction of their local industries to the school's program and to the school's former students employed in industry. But in most communities, there is little or no communication between the public school and industrial management. This is unfortunate since the public school and industry have a mutual interest in the more efficient preparation of youth for life—including their employment—in our highly industrial society. Both the public school and industry could profit by a more cooperative working relationship and through a more frequent exchange of opinions and ideas.

Recently a questionnaire was distributed to the men in the manufacturing industries who are responsible for the training and upgrading of employees—industrial-training directors. This survey attempted to find out their opinions as to the role of the public secondary school in the general and occupational preparation of youth for life and for employment in the skilled and semiskilled jobs of the manufacturing industries. These men were asked the questions that you, as an industrial-education teacher, supervisor, or administrator would like to have answered.

TABLE 1

Response of Industrial Training Directors to the Question: What Should Be the Principal Aim or Objective of the Public Secondary School in Providing Preparatory Courses for Youth About to Be Employed in Skilled and Semiskilled Jobs of the Manufacturing Industries?

Opinion as to Principal Aim or Objective	For Youth Entering Skilled Occupations		For Youth Entering Semiskilled Occupations	
	Number	Percent	Number	Percent
Make immediately productive workers in some one occupation	10	3.7	10	3.7
To teach specific skills, knowledge, etc., for a "family of jobs" in industry	78	29.2	19	7.1
To teach some generally usable industrial skills, knowledge, etc.	28	10.5	43	16.1
To teach industrial materials, processes, organizations, and a few simple skills	58	21.7	77	28.8
To provide a basic general-education program with some industrial applications—no skills	45	16.9	69	25.9
To provide a general education program only—no industrial applications	22	8.2	25	9.4
Other than those designated above	6	2.2	6	2.2
No response	20	7.5	18	6.7
Total	267	100	267	100

Before we report answers to these questions, we should explain more about the respondents to the questionnaire. All of these men are, or were, members of the American Society of Training Directors, a professional organization of management men responsible for educational and training programs in the major industrial companies of America. In this survey, only training directors associated with the manufacturing industries were questioned. This group was selected to get industry's answers because its members have a more intimate and closer working relation to the public-school's product — "trained youth" — than do some other segments of industrial management. It is somewhat in the position of a "consumer group" rating a product, criticizing its merits, and making suggestions as to its deficiencies and possible improvement. But these men not only "use" our students, they have the responsibility for continuing their "education." Industrial-training directors also have other unusual qualifications as "critics" of the secondary-school's general and occupational preparatory programs. Almost half of the training directors have had teaching experience; many of them are also experienced in personnel, sales, supervisory, and skilled work fields. Industrial-training directors seem to have the qualifications and the vantage point from which to observe the "results" of secondary-school programs and to answer questions on preparation of persons entering industrial employment.

The $64,000 Question

This survey asked the $64,000 question first: *Does the public secondary school have any important function or*

responsibility for the occupational preparation of youth entering the skilled and semiskilled jobs of industry? More than 92 percent of the industrial-training directors believe that the public secondary school has important functions and responsibilities in the occupational preparation of youth entering these jobs of industry.

Now most people agree that the public school has *some* function and responsibility in the occupational preparation of youth, but they do not agree as to *what* the functions and responsibilities are. When training directors were asked to state, or choose a statement, best describing the main function of the school in preparing youth for entering *skilled* industrial work, 23.3 percent of them indicated that school should provide occupational preparatory instruction in specific skills and knowledge used by workers in some "family of jobs" in industry along with some general education courses. Over half (57.4 percent) of the training directors designated the school's function in the preparation of youth for entering skilled industrial employment as including some instruction that is occupationally oriented and that includes some occupational training in skills as well as in knowledge. There was some difference in opinion as to the degree of specialization of the occupational skills to be taught.

TABLE 2

Response of Industrial Training Directors to the Question: What Services Should the Public Secondary School Provide to Help Youth Prepare for and Succed in Jobs in the Manufacturing Industries?

Opinions as to Services the School Should Provide	For Youth Entering Skilled Occupations		For Youth Entering Semiskilled Occupations	
	Number	Percent	Number	Percent
Occupational information and survey courses	172	64.4	169	63.3
General industrial education, or industrial arts	124	48.4	145	44.3
Prevocational and occupational exploratory experiences	143	53.6	136	51.0
Vocational guidance and counseling	237	88.8	222	83.1
Vocational preparation toward occupational competency	117	43.8	71	26.6
Specialized occupational preparation for one job	71	26.6	25	9.4
Employment agency, or job placement	87	32.6	91	34.1
Coordination, on-the-job follow-up and adjustment	78	29.2	75	28.2
Off-work hours extension courses for young workers	181	68.0	162	60.7
All other services designated	19	7.1	15	5.6

The School's Function

Since the "Prosser Resolution" there has been a growing interest and discussion of the secondary school's function in the general and occupational preparation of youth entering the *semiskilled* jobs of industry. Twenty-seven percent of the training directors believe that the secondary school should provide these youth with preparatory instruction in occupational skills and knowledge which would be of general use in industry along with some general education courses. About four of every ten training directors recommend that the secondary school provide some type of instruction that is occupationally oriented and which includes content in skills as well as knowledge for youth likely to enter semiskilled industrial work. Some training men state that it would be difficult, if not impossible, to distinguish and separate school youth likely to enter semiskilled jobs from youth likely to enter skilled work. These training directors suggest that the school should attempt to motivate these youth to achieve higher occupational goals. They say that semiskilled jobs are continually being eliminated from industry, due to technological progress—youth have nothing to gain in setting low occupational goals. Although many boys may have to accept semiskilled entry jobs, they can progress rapidly to skilled and even technical positions if they have good secondary-school occupational and general-education preparation.

What should be the principal aim or objective of the public secondary school in providing preparatory courses for youth about to be employed in the manufacturing industries? Table 1 shows the distribution of the response of industrial-training directors to this question. The response shows that almost 30 percent believe that the school should aim to teach youth likely to enter *skilled* work the specific skills and knowledge of a "family of jobs" in industry. Over 65 percent of their responses indicate that the school should aim to teach these youth some occupationally oriented skills as well as knowledge. But less than 4 percent believe the school should set as its objective: "to make immediately productive workers in *some one* occupation." Only one of every twelve training directors believes that the secondary school should provide a "general education only" for these youth.

The aim or objective of the school, for youth likely to enter *semiskilled* work, should be, according to 28.8 percent of training directors, "to teach industrial materials, processes, organizations, and a few simple skills." Almost 56 percent of the training directors designate some type of instruction aiming to teach these youth some skills as well as knowledge. The distribution of the response indicates that training directors believe that occupational preparatory offerings for these youth should teach the less specific, or more generally usable, skills and the more general types of industrial knowledge. But less than one of every eleven training directors would provide a purely general-education program for these youth.

Desirable Services

Table 2 shows the response of the industrial-training directors as to the *services* the secondary school should properly provide for youth who are about to enter the skilled and semiskilled jobs of the manufacturing industries. Vocational guidance and counseling is thought by more than eight of every ten training directors to be a proper and desirable school service to youth entering industrial employment. Off-work hours extension courses for young workers, occupational survey courses, prevocational and occupational exploratory experiences, and industrial-arts and vocational-industrial courses are also indicated as proper for youth entering *skilled* jobs.

Most of these same services were indicated as proper for youth likely to enter *semiskilled* industrial jobs. The more specialized types of vocational training and occupational training for *one job* are not considered by training directors to be so relevant for these youth. The questionnaire provided space for writing in suggestions as to additional services the school could properly provide; only 7 percent of the training directors suggested any.

A number of training directors suggested cooperative (school and industry) occupational preparatory courses. This type of course was recommended as a solution to the problem of preparing youth for employment without jeopardizing their high-school graduation. Training directors are not so "sold" on coordination and placement (employment agency) as school services as are the industrial educators. Since placement and coordination seem to be logical component services of school (and industry) cooperative courses and since these services require the active cooperation of industrial managements, there seems to be a need for "selling" these services to industrial management and training personnel.

Industrial-training directors believe that the school should be selective in enrolling youth in courses designed primarily for occupational preparation. A majority of industrial-training directors believe that youth should be 16 or 17 years old to be eligible for courses preparing youth for *skilled* work, and 15 or 16 years old to be eligible for courses preparing them for *semiskilled* work. Training directors believe that the main criterions for enrolling applicants of eligible age should be: (1) that youth have the aptitudes to benefit from the courses, and (2) that youth have positive motives for enrolling in the courses.

Vocational choice, although considered one of the desirable motives in applicants, is not emphasized by industrial-training directors. The reasoning here is that these youth are not mature enough to make valid vocational choices; they will make more intelligent and decisive vocational choices after they complete secondary school. Industrial-education teachers may feel that this is inconsistent with the strong support of training directors for vocational guidance and counseling reported earlier. However, if one conceives "vocational choice" as an evolutionary process in each individual, he can see that both guidance and *choice making* are important in the process, but any one choice of a teen-age youth may be relatively unimportant in that youth's over-all occupational preparation and career.

Industrial-training directors, like all management personnel, are interested first in the productive efficiency of employes. To get their candid opinions as to the value of prevalent occupational preparatory patterns, training directors were asked to rank these patterns 1, 2, 3, 4, 5, in order of their merit in preparing youth as workers in the manufacturing industries (only relevant items were to be ranked). Table 3 shows the number and percentage of training directors ranking each training pattern and the average rank of the item.

No Outstanding Pattern

No one pattern is ranked as outstanding. The mean ranks of several occupational preparatory patterns tend to be concentrated near the mean rank of 2.5. However, "improved apprenticeship training," cooperative vocational courses, and the full-time day-trade school patterns rank first, second, and third in order of their merit in preparing youth for *skilled* work in industry, according to the judgment of training directors.

Training directors rank industrial-arts courses, cooperative-vocational courses, organized on-the-job training, and full-time day-trade courses as first, second, third, and fourth in order of their merit in preparing youth for work in the *semiskilled* industrial jobs.

The rankings show that training directors, as a group, have little respect for "pick-up training" on the job even though most workers in industry today probably learned their occupational skills by the pick-up method. The survey findings seem to indicate a trend in management's thinking away from the unorganized and loosely-organized patterns of training and toward better organized patterns of instruction including related supplementary technical instruction. These more highly organized patterns usually recognize the public secondary school as having some significant part or function in the preparation and upgrading of industrial employees.

Industrial-training directors' support of the cooperative occupational training is one of the most significant and encouraging findings of this survey. Industry has learned the value of this type of program in operating such programs in cooperation with the engineering and technical schools in preparing engineers and technicians. More recently, business and industrial firms have cooperated in the vocational training and education of secondary-school youth in similar programs known as part-time cooperative-vocational courses.

(*Continued on page* 65)

TABLE 3

Pattern of Occupational Preparation Ranked* as to Their Merits in Preparing Youth as Workers in the Manufacturing Industries, by Industrial Training Directors

Patterns of Occupational Preparation	For Youth Entering Skilled Occupations		For Youth Entering Semiskilled Occupations	
	Number	Mean Rank	Number	Mean Rank
Full-time day-trade vocational school	169 63.3%	2.6	150 56.2%	2.7
Cooperative school and industry on half-and-half time basis	187 70.0%	2.6	157 58.9%	2.5
Industrial arts or general industrial education	129 48.3%	3.0	178 66.8%	2.4
Specific "vocational training" job skills and knowledge	163 61.0%	2.9	137 51.4%	2.9
Organized on-the-job training by employer (other than apprenticeship)	162 60.7%	3.4	213 80.0%	2.6
Traditional apprenticeship training	109 40.8%	3.2	48 18.0%	3.7
Modern or "improved apprenticeship" with school related instruction	199 74.5%	2.4	98 36.8%	2.8
"Pick-up training" on the job by observation and imitation	14 5.2%	3.9	60 22.5%	3.8
Other patterns not designated above	5 1.9%	2.5	5 1.9%	3.2

***Respondents were asked to rank occupational preparatory patterns 1, 2, 3, 4, 5, in the order of their merit, in preparing youth as workers. Rank 1, indicating first, or highest merit, rank 2 second, etc. Only relevant items were to be ranked.**

Industry Looks at Industrial Education

Condensed from a study made

By Fred Strickler

Education Director, Central Division, National Association of Manufacturers, Detroit, Michigan

TO discover the attitudes of industry regarding the effectiveness of our public schools in providing instruction that is helpful to pupils when they enter industrial employment, an inquiry was sent out.* Answers were received from men in 62 companies, located in 32 cities in four different states. This is rather a limited number, too limited, in fact, to draw any definite conclusions, but the answers do provide a random sampling of opinion which may serve to raise questions and stimulate thought in the minds of SCHOOL SHOP's readers. In this article we'll report points of view rather than analyze and evaluate them. You'll find direct and combined verbatim comments throughout.

Keep in mind that differences in the points of view included in this article arise out of differences of experience with applicants of varied training competencies (acquired in schools varying from one-man shop industrial-arts departments, up to well-staffed and well-equipped comprehensive vocational schools) and the worth of these competencies to industries which range from unskilled categories up to highly complex process plants. Each point of view is probably valid for its particular setting. Hence, the differences do not cancel themselves out.

On the Plus Side

The first question, "What is being done in industrial education in the schools that is helpful to the employe on his job?" brought many interesting answers and a lot of praise.

Several persons answering the inquiry spoke highly of the value of technical high schools and trade and vocational schools. They referred to the worth of apprenticeship programs and the schooling required, in addition to the training given in industry. One company found an industry-vocational high-school cooperative program for juniors and seniors exceptionally beneficial because it teaches mathematics, blueprint reading, elementary and advanced drawing, and sciences.

Vocational teachers were commended by another firm for contacting plants to ascertain what preliminary education is required for a young man to enter a training program in industry and their desire to develop students who will be a credit to their school by becoming outstanding skilled tradesmen. They were also praised for distributing printed material secured from industrial firms which describes the product, its sale, company personnel policies, texts, advertising tear sheets, employe handbooks, etc., which help the student understand industry. Tours through related industries are thought of highly. Placement of teachers themselves in industrial occupations during summer vacations enables them to impart a more realistic picture of factory atmosphere and practices to their students.

Helpfulness of a knowledge of materials, understanding of shop procedures, and familiarity with the basic fundamentals of tools and machines (primary skills) is touched on time and again in the responses in one way or another with particular reference to drafting, mechanical drawing, blueprint reading, math, and science. Such subjects provide fundamentals which serve as a solid foundation on which applicants can build skills, the spokesmen from the companies felt. Guidance programs which help in the choice of occupation were commented on. Other points brought out in favor of industrial education in schools are its positive effects on the retention of students in school; the promotion of teamwork; stimulating the desire to find the reason for doing things a certain way; preparation for greater and more varied job opportunities; shortening of formal training periods; more rapid on-the-job promotions; greater awareness of safety practices; providing some insight to the planning and preparation needed to manufacture a product; and making better satisfied employes.

Some direct quotes from the replies include these:

"We have had good success with employes from our city vocational school. From the other schools, however, we feel more time could be spent on instruction in at least the use of small tools."

"Graduates of vocational schools have been successful in our industry. High types of employes."

"Generally the industrial-arts education given in the majority of our junior- and senior-high schools is adequate to take care of the students who elect to take this type of program. The trades training in such schools as (name deleted) is quite complete and gives a good background for entrance into occupations and industry."

"In our opinion, industrial education is doing an excellent job in training young men for their place in industry. Locally, approximately 66 percent of the students graduating from vocational schools obtain employment in their field of training."

"In general, industrial education is fulfilling a purpose useful to both industry and the individual, on the job and as a person."

"By and large, we believe that industrial education is doing an excellent job with the facilities that they have and the severe economy under which they must necessarily operate."

The Other Side

On the other side of the ledger, here are some weaknesses or failures of industrial education which handicap the employe on his job, according to the firms queried. Here is what they say:

"Industrial education has been only a minor adjunct to many school pro-

*EDITOR'S NOTE: This is a condensation of the views of a selected group of manufacturers in one industrial area and does not necessarily reflect the thinking of American industry as a whole nor the policies of the National Association of Manufacturers.

grams and there are too few high schools specializing in trade and technical fields. Too few students, really suited to and interested in shop work, have been able to secure adequate training with adequate facilities. Schools do not have the close cooperation of industry, such as advisory groups, that is needed to bring their industrial programs up to the needs of industry," one answer stated.

One company came right to the point in a frank answer. "We are for better-educated employes, but our experience has been expensive and sad. We really gave the boys a well-rounded apprenticeship because we wanted them as replacements, not as cheap labor. Until they appreciate the value of this effort, we feel inclined to look at vocational training as an expensive hobby," they said.

Some of the firms replying recognize that schools cannot train for full-scale industrial jobs, but they deplore the lack of simple, common horse-sense mechanical knowledge . . . inadequate skills in the correct use of small tools which is noticeable when workers bid for set-up and repair jobs. Supervisors sometimes find that in instructing such people they have to start their instruction with correct usage of such tools as the Allen wrench and screwdriver. Quality courses set up for handtools, modern welding, machine shop, automotive procedures, and the like, combined with opportunities to take machines and engines apart and put them together again, would go a long way toward preparing applicants for special consideration for apprenticeship and other training programs offered by industry. They should be properly instructed every step of the way because knowledge and impressions picked up in the process are hard to change and may remain as handicaps on the job.

About one-fifth of the respondees point out deficiencies in elementary mathematics, shop math, algebra, geometry, and trigonometry. A weakness in the physical sciences and English is noted several times. Students who cannot read well, or express themselves well, handicap themselves in acquiring trade information from the literature and in writing reports. Certainly, the above subjects are becoming increasingly necessary for better grades of employment in our modern scientific industries.

Still another industry states: "Principals and counselors do not encourage boys to take vocational subjects and a mathematics background. In many cases, there isn't a program for testing and try-out to see if the students have the necessary aptitude for the vocation of their choice. Too many people in and out of the educational system believe that the industrial-arts and trades and industry programs are intended for the dullard. There is considerable emphasis of purely academic and cultural education and not enough objective realization that a large majority of the students will not go beyond high school. In turn, a good percentage of all students leaving high school at any level will at least start in unskilled or semi-skilled work, or as learners in a trade. If this assumption is correct, then there needs to be more emphasis on this reality and a greater effort made to see that pupils have at least a rudimentary exposure to mechanical crafts and industrial arts. . . . It will take a general awakening among students and a thorough understanding among teachers before any considerably larger group goes into industrial-arts and trade training. School counselors should play a more dynamic part in effecting this change."

The outstanding failure, as one group sees it, is the failure of the schools to attract a consistently high-caliber instructor for the various courses which could be of most value to industry—good teacher prospects from industry are often ruled out by academic requirements. And too many vocational instructors fail to keep abreast of new developments made by industry and the machine-tool manufacturers and have little or no conception of the actual work performed in the skilled trades. This fact is quite conclusively established by the number of young men who are encouraged by their instructors to apply for specialized training, but who have received far from sufficient scholastic background to qualify for training in the skilled trades. . . . . Industrial-arts teachers in particular have not spent enough time working in industry and fail to teach production methods. There is a shortage of versatile, imaginative, creative teachers, the group concludes.

Suggested Improvements

When asked for suggestions as to how industrial education in the schools could provide the training which may better serve the employe on his job, answers from the 62 industries queried offered these ideas:

"School administrative staffs and counselors should make more frequent visits to industry to determine requirements and have a better appreciation of the opportunities which industry offers in their area. If possible, students should be given this opportunity also . . . an effort to be more realistic about the type of secondary education requires a factual community realization of the problem and a promotional campaign with the parents as well as the students. Where possible, increased emphasis should be placed on counseling of students at the junior-high level to stimulate constructive thinking about their vocation and the best use of present facilities for effective preparation for it."

"Schools cannot be blamed too much for inadequate facilities for industrial-arts and trade training," states another reply. "Politically they must respond to the demands and adjust to the limitations set by parents and taxpayers. School people and industry should work together on the problems of providing additional county or area technical and/or trade schools; expansion of facilities for training high-school students in shop and related work; credit for work at place of employment in substitution for similar lab requirements; evening classes for employes."

Queried concerning the teachers, here are some of the answers:

"Teacher training should be broadened so that industrial-arts teachers have a wider range of knowledge in more subjects so that they may be qualified to teach both manual skills and related subjects, including the latest developments in production and automation."

"More opportunity should be provided for nondegree students to enrol in college with relaxed arts requirements for engineering and scientific studies to shorten the period of training."

"Industrial-arts instructors should be encouraged to spend their summers either working in industry or attending classes at a university (or during the year in evening college)."

"Provisions should be made to give salary increases based on the up-grading activities of the instructor during evening hours or vacations — better pay for better teachers."

Summarzing the replies which were received, here are some generalizations:

"An attempt should be made by educators to make the student think of his future and his future responsibilities while he still has a chance to absorb some of the knowledge made available by our schools."

"Develop in the student a greater interest to understand the complexities

(*Continued on page 66*)

More cars on the road; more cars needing repairs. In looking for manpower

The Automotive Industry Looks at Industrial Education

By Stanley S. Roe

Automobile Manufacturers Association, Detroit, Michigan

THE automotive industry's need for employes with a high degree of skill and training is greater today than ever before in its history. It is certain, as well, that the need will grow in the future, along with the inevitable progress of technology.

New machines and methods of production have been making dramatic changes in automotive plants during the postwar years. The word "automation" has been coined and made into a familiar, if not always fully understood, term. Mechanical or electronic devices have taken over some of the more burdensome and tedious unskilled jobs in the factories, creating at the same time a greater demand for technically trained specialists.

This industry looks to educators and educational institutions to help in providing the ever-growing supply of educated and skilled employes that it needs in all phases of its operations, from processing raw materials to servicing its finished products. Automotive companies are vitally interested in doing all that they can to foster industrial education, both by assisting educational institutions and by conducting internal educational programs of their own.

The full story of the industry's educational activities and interests would be too much to cover in one brief article. Perhaps, however, the story could best be told by citing one program as an example of how industry and education can work together on mutual problems. This is a cooperative program of the automotive industry and the American Vocational Association to raise the standards of automotive service instruction in the nation's schools.

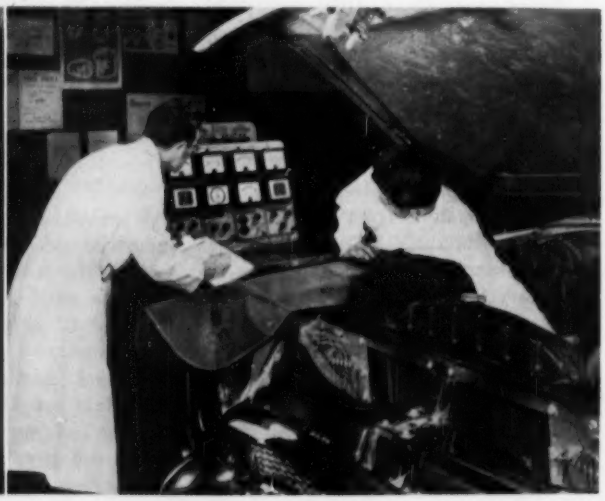
The need for well-trained automobile mechanics is very great at the present time and is expected to increase in the next ten years at a rapid pace. Motor vehicle registrations have practically doubled since World War II and we anticipate equally rapid growth in the decade ahead. Actually, a serious shortage of adequately skilled automotive mechanics has faced the industry for some time. And, to meet the tremendous anticipated growth in demand for automotive service, the nation's supply of trained automotive mechanics must be greatly enlarged in the next few years.

The number of motor vehicles in use and requiring service has increased greatly. In addition, the newer cars, trucks and buses are more complex, more precisely engineered and machined than vehicles of the past. This, of course, means that the mechanic of today must have greater knowledge, greater skill, and better equipment than before. It means, simply, that he must be better qualified, more thoroughly and more expertly trained to do his job satisfactorily. The automobile industry is convinced that the major portion of this need will have to be satisfied through the training of new mechanics in the nation's industrial-education system.

The day of the selftaught automobile mechanic has passed. Today's cars, with their automatic transmissions, high-compression engines, power assists, air conditioning, and many other features, require the services of skilled technicians

Vocational opportunities for young men in the automotive field include such occupations as parts and service managers as well as dealerships.

The day of the selftaught automechanic is pretty much past. Modern testing and other equipment requires that the mechanic be expertly trained.



who have acquired their basic knowledge and skills through some form of organized training program. Other technical developments now on industry drafting boards and in the laboratories will add to the need for thoroughly trained men.

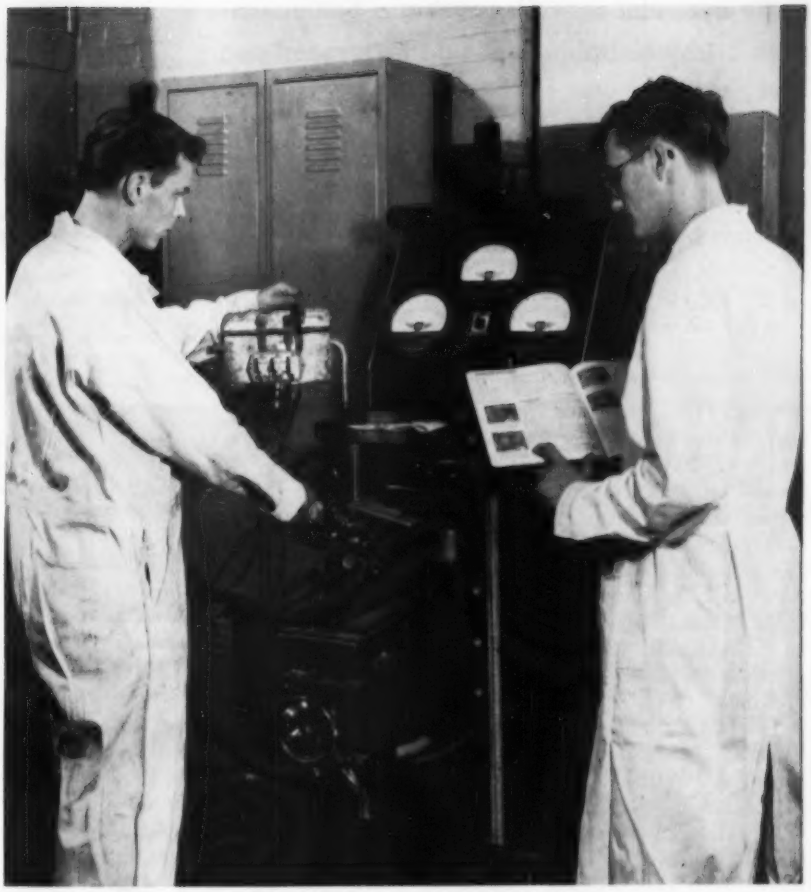
We in the automobile industry know that the best way for young men to receive this training in the fundamentals of automobile service and repair is in our school shops. This training will qualify them to accept starting assignments in dealers' shops and other service operations. From this point on, the industry and its dealers will undertake to give young men the experience and specialized training they will need to become skilled service technicians.

Conscious of the importance of industrial education to the industry, the automobile industry has for several years been working with representatives of industrial education in the development and promotion of a complete and carefully thought-out program. For over ten years this effort has been carried on by a joint industry-education group known as the Automotive Industry-Vocational Education Conference Group. This group, with the aid of numerous consultants from industrial education and from industry, developed a series of recommendations on various aspects of automotive service instruction in schools.

These recommendations have been published in a book entitled *Standards for Automotive Service Instruction in Schools.* Separate sections of this book have been prepared to: (1) point out to young men the advantages of a career in automobile service; (2) offer suggestions to counselors for helping them decide whether applicants are suited for such a career; (3) provide suggestions concerning auto-shop layouts; (4) recommend the supplies and equipment needed for the automotive shop; (5) give detailed recommendations on course content; (6) discuss cooperative training programs and other school-dealer relationships; (7) outline methods of handling actual service work in school shops; and (8) furnish information useful in connection with training of automotive-mechanics teachers through cooperative college programs and summer workshops.

Copies of this book are available on request from the Automotive Industry-Vocational Education Conference Group, 320 New Center Building, Detroit 2, Mich.

Other evidence of its interest in and dependence on our school shops is found in the efforts of the industry to assist the schools in various ways. Included in these efforts are the establishment and conducting of summer workshops, making available to auto-mechanics teachers the facilities of the special service-training schools maintained by the industry, providing teaching aids of various kinds at reduced costs or free of charge, urging motor vehicle dealers to work with their local school authorities in developing and maintaining sound automotive courses, and participation by industry officials in local and national conferences of industrial educators. All of this is evidence that the automotive industry places a great amount of confidence in the ability of the industrial-education system to help perform the important job of selecting and training the men necessary to give its customers good service on their vehicles.



Technical developments in the automotive industry in recent years plus many new ones now on the drafting boards and in the laboratories add to the need for competent and thoroughly trained men.

It should be pointed out that the young men who come to the industry from school shops may not only be employed as automobile mechanics. These men are an important source for positions in other areas in the manufacturing, distribution, and service of motor vehicles where a background of automotive service is either a distinct advantage or an absolute necessity. The opportunities for graduates of vocational courses include such things as dealer-parts managers, service managers, and even the dealer himself. The young man may set up his own business as a specialty repair shop or parts and equipment store. He may find employment with car and truck manufacturers in such jobs as service representative, service engineer, or technical correspondent. Large fleets have their own maintenance operations and the management of the service shop is usually handled by men who started out as automobile mechanics.

Thus, industrial education is doing a tremendous job for the automobile industry. It is cooperating with the industry in developing and establishing a sound program of training in automotive service so that the industry with its related businesses, can provide worthwhile employment to a large number of individuals, have a pool of competent people from which to draw on for other important assignments in the industry, and also provide satisfactory service to its customers, the millions who buy cars. ★

Is the beautiful artwork causing a bottleneck?
Here's why techniques should be streamlined

Industrial Drafting Looks at Industrial Education

By Arthur H. Rau

Consultant, Drafting, General Electric Company, Schenectady, N.Y.

DRAFTING education has always been primarily concerned with the theory of drawing. The student is impressed with the importance of painstaking exactness in measurement and delineation, and with the necessity for time-consuming elaboration of details. As a result, he emerges an artist, skilled in the theoretical niceties of drafting as an art, but with little knowledge of the practical requirements of industrial drafting.

This unrealistic concept is further heightened when the novice sees many experienced draftsmen in industry using the same techniques. He finds that they, too, trained in the same school of thought, believe in the necessity for fussy detail and needless elaboration. Thus he has every reason to believe that such procedures are sacred cows. As a result, his drawings are letter-perfect according to the book, but very expensive to prepare, to use, and to keep up-to-date.

One of the criticisms of mechanical drafting, as taught in our schools, is that many textbooks appear to consider the drawings as being ends in themselves when, as a matter of fact, they should be merely media through which someone is attempting to convey information to someone else concerning a piece of equipment which has to be made or erected. Teachers frequently put more effort into obtaining from the pupils an artistic production than they do on the accuracy of the information provided and the need for economy of time in the production of drawings.

A rapidly growing effort is being made in industrial organizations to overcome the effects of this form of instruction. This involves the adoption of a functional system of drafting which has been found to be more economical, both in time and material, than the traditional textbook methods.

Throughout all of industry, now as never before, there is a need to increase the effectiveness of engineering organizations. This need is dictated not only by an acute shortage of trained personnel but also by economic necessity. One of the answers to this need is better overall efficiency and increased individual output.

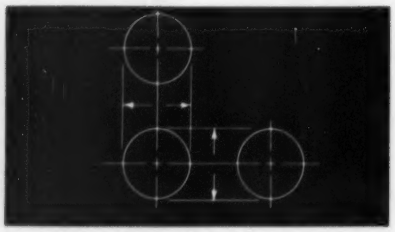


Fig. 1. This is frequently called the "cannon-ball blunder," derived from three identical views.

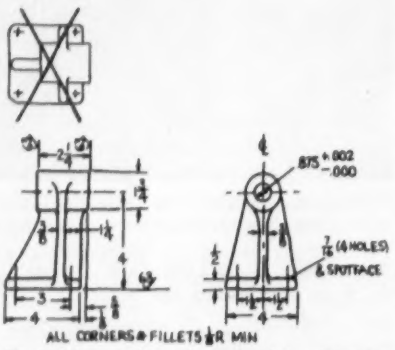
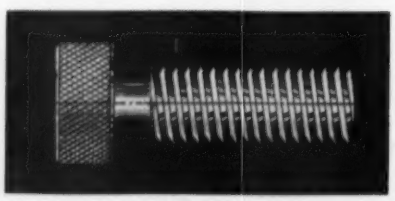


Fig. 2. Views with no dimensional or written instruction can usually be omitted, as illustrated.



This is inspired artistry, but is such artistry necessary considering the hours spent on it?

Engineering efficiency can be improved, and output per man increased considerably, if certain new methods and other known principles are applied to streamline drafting operations. For example, activities which deprive designers or draftsmen of the opportunity to make full use of their technical training, experience, and ingenuity should be eliminated from their daily assignments. Thus, by extracting routine duties and other functions which do not contribute to the design portion of the normal engineering assignment, more time will be made available for the real productive effort of creative thinking.

Drafting—a Key Function

Since drafting is a key function in the engineering operation and is responsible for the expenditure of a large portion of the engineering budget, industry must constantly search for new and better methods and materials to effectively reduce the time and effort required to make drawings.

Not long ago several departments of the General Electric Company, motivated by a critical shortage of skilled technical personnel, engaged in a comprehensive study of their drafting and drawing reproduction practices. The results underscored a need for a more extended study on the subject, and consequently drafting practices throughout the General Electric Company were critically examined for simplifications.

As a result of this study a number of significant and far-reaching improvements in drafting methods and materials were developed and perfected. Where these new developments have been realistically applied and systematically followed, a measurable increase in output and a substantial improvement in overall efficiency of the drafting operation has been realized.

Over a period of years the average textbook of engineering drawing has treated the mechanical drawing with its many-sectioned views as a work of art, or as the end product, where it would be sacrilege not to project every hidden surface whether the views were needed or not. Today this concept is as outmoded as the horse-drawn streetcar.

In courses of instruction in fundamental drafting the pupil is generally

required to complete a specified number of views on his drawing. This is a requisite so that he may gain necessary practice in projection, and time is not necessarily an important consideration. In industry the cost of the drawing becomes an important part of the cost of the product. The industrial draftsman, therefore, must use a minimum number of views to furnish the required information with completeness and clarity. Many parts can be completely and adequately shown by using a single view or even described without any delineation. Regardless of the number of views required, anything more than the minimum is wasteful drafting effort.

Drawing more views than necessary is familiarly called the "cannon-ball blunder." It derives its name from drawing three views of a cannon ball (Figure 1). This same absurdity appears, only faintly disguised, on many drawings. Figure 2, for example, is an illustration taken from an actual working drawing.

Many people in industry, including the author, feel that the theory of orthographic projection—the foundation on which the field of drafting stands—must still be taught. The draftsman must know *how* to project, but it seems that today's industrial requirements make the *when* to project of even greater importance.

A drawing is a precise instruction. Therefore, in order to have value, it must be simple, concise, accurate, and immediately understandable to the user. There can be no compromise with this functional concept in evaluating a drawing. It must have enough lines on it to convey what was in the mind of its creator. No more, no less! Less would make the drawing worthless. More would be a waste of time, and therefore a waste of money.

The time element in industrial drafting, as in all other branches of industry, has compelled the adoption of a new yardstick for the measurement of drafting values. Drafting stripped of its frills, yet surrendering nothing in either clarity of presentation or accuracy of dimension, must be the new standard for industry if we are to successfully meet the increasing social and economic pressures.

The author has had the opportunity of examining the drawings and techniques of many drafting organizations throughout the country. A study of them always indicates that much progress has been made in regard to eliminating unnecessary work and, perhaps, in simplification of delineation. This should suggest to the drafting teacher that he follow the trend indicated in industry and concern himself with the task of impressing on his pupils the need for the conservation of time and effort in the drafting room.

While some teachers may be familiar with the term "drafting simplification" and may have attempted to emphasize it in their teaching, there are many others who think of the expression as some sloppy shortcut that is sure to cause confusion in the minds of those who use their drawings. This misconception is usually due to a misunderstanding of the term "simplification."

Simplified Drafting

What do you understand by the term, "Simplified Drafting Practice"? Webster describes "simplicity" as "plainness resulting from absence of ornament, once regarded as a deficiency; now considered a merit." Webster also says, "simplification" is "artistic presentation of typical or general features which, in life, are *obscured* by complex details."

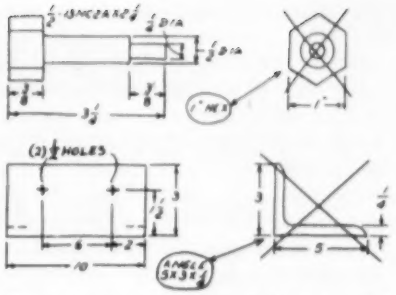


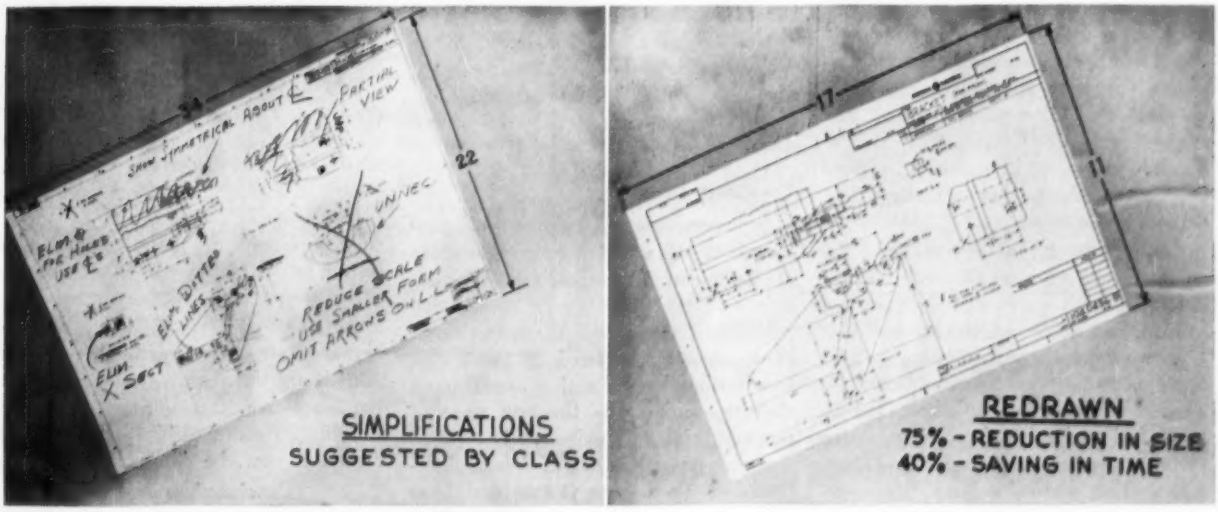
Fig. 3. "If you can describe it, don't draw it," says the author.—This diagram shows his ideas.

So a simplified drawing—taking it directly from the unabridged dictionary—is one in which the complex details that are obscuring its message are omitted. We could follow this by saying that a simplified drawing is a functional drawing where every line, every legend, and every view are drawn with a purpose, and where fussy or superfluous elaboration is not obscuring the real purpose of the drawing. *A simplified drawing is a functional drawing.* This is the fundamental or basic concept of "Simplified Drafting Practice."

The opportunity to effect savings by eliminating "work-that-should-never-have-been-done" presents a real challenge. Extra views, unnecessary lines, repetition, conventional representation instead of symbolism are but a few glaring examples.

The industrial draftsman is a vitally important link between the engineering and manufacturing or construction sections. By the very nature of his work, he has considerable license in the ex-

After studying this drawing objectively, a drafting class suggested many simplifications which were executed. The second try was accurate and clear.



penditure of a company's funds when preparing drawings and specifying and ordering materials and labor. At the same time he has unlimited opportunities to effect savings by reducing material costs and drafting expense. An important part of a draftsman's job is to convey information and issue instructions. Since the direct and simple way is always the best, he must be able to recognize at once the difference between the necessary and the unnecessary. In order to produce the functional drawings he must plan the drawing. Before he can adequately plan the drawing, he must resolve, in his own mind, two simple questions: (1) For whom am I making this drawing? (2) What do I want to tell the user of this drawing?

Then, and only then, can he, with confidence, select the proper drawing size and spend his precious time in putting every bit of information on that drawing for manufacturing or construction use.

In industry we want our draftsmen to spend more time thinking about functional improvements for constructing the part and give more consideration to describing the part with precise dimensions and instructions. In today's economy there is no time to spend on pictorial niceties, such as shading, crosshatching, fancy lettering, various line weights, etc.

A Superfluous Line Is a Waste

Our customers, or the planning, production, manufacturing, and construction people for whom drawings are principally made, are not in the least bit interested in drafting techniques or in beautifully executed, time-consuming layouts and orthographic projections. What they want is information that is complete, concise, accurate and on time. The medium chosen for transferring information from the engineers and draftsmen to the user of the drawing should depend entirely on which method requires the least amount of work and conveys the information clearly and without question. For instance, if it is possible to convey information by word description alone, then no supporting delineation is needed.

Complex parts can obviously be described more economically with illustrations than with words. For such parts, a drawing is made which serves as a framework to support dimensions and other necessary information. Explanations can, however, complement illustrations and make the drawing of extra views unnecessary as shown in Figure 3. In other words, a good draftsman should use no more delineation than is necessary to present his story with clarity and completeness. In this connection, some industrial drafting operations have adopted this slogan, "A superfluous line is a waste of time."

Here's a typical class of working draftsmen, under Mr. Rau's direction, studying a drawing which was made by one of the group. As ideas to simplify occur, they are called out spontaneously.

A drawing containing superfluous lines or unnecessary delineation and information means that not only has too much time been taken by the draftsman in its preparation, but more important, a continual use of additional time for interpretation by everyone required to use the drawing has been made necessary. Fussy details and too many lines tend to confuse the user of the drawing.

The use of unnecessary lines, repetition, and unnecessary elaboration as illustrated in one of the pictures is an obvious and extreme example of unnecessary elaboration reproduced from an actual working drawing. A good industrial drawing, however, is recognized by clear, clean, line work, well selected views, legible dimensioning, and economy of presentation, not by elaboration or useless artistry.

Freehand Drawing

In industry the challenge to the draftsman is to utilize to the fullest extent his ability to contribute ideas for new products or for improvements of existing products. This calls for the reduction of effort and time required by the draftsman in the physical action of making a drawing, and one of the best ways of accomplishing this objective is through the widest possible use of freehand delineation. Tests have proved that freehand drawing, when used judiciously, is practical and certainly more economical than the conventional practice of using straightedge, instruments, and scale. This suggests that drafting teachers should place greater emphasis on developing the freehand sketching ability of the draftsman and engineers of the future now in their classrooms.

To facilitate freehand drawing, many industrial firms now have their drawing forms imprinted with nonactinic blue cross-section lines over the entire drawing area. This makes it quite easy to make a good freehand drawing. The blue grid lines "burn out" and therefore do not show on reproductions made from the original drawing.

Pencil vs. Ink Drawings

The introduction of new and improved drafting materials coupled with advanced graphic reproduction techniques and materials have all but eliminated the need for preparing hand-inked drawings. Today, less than 5 percent of all engineering drawings produced by most industrial firms are rendered in ink. It is expected that this costly and time-consuming practice will be practically eliminated in the not too distant future as the techniques of graphic reproduction become further advanced.

Although the foregoing is generally known, drafting students in a number of schools are still required to spend many hours manually tracing plate after plate in ink, perfecting skills that they will rarely, if ever, be called on to use in

(*Continued on page 62*)

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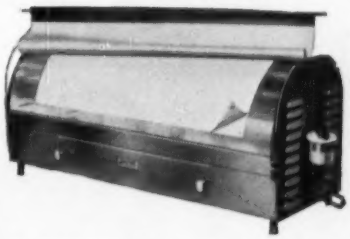

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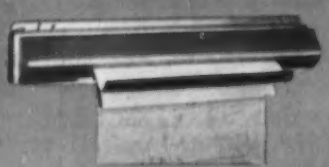

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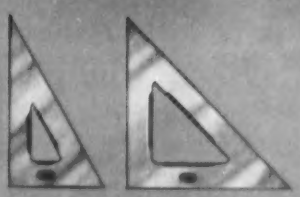

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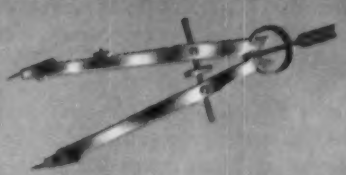

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The Changing Picture in Industrial Drafting

By A. J. Philby

Associate Professor of Engineering Drawing,
Ohio State University, Columbus

DRAFTING teachers in the past either came from industry, with no teaching experience or training in methods of teaching, or from the manual-training area, with only the bare essentials of drafting, and little insight into the methods of teaching it. The aim generally was one of developing a reasonably high degree of manipulative skill.

A student exposed to this type of instruction usually started in the drafting room as a tracer when he got his first job. His real knowledge of representational drawing was learned by association with his coworkers, briefings by the chief draftsmen, and home study. The standards of practice and procedure were generally set up by the chief draftsman, and were usually limited to the particular needs of the company. A change in jobs from one company to another more than likely required a new indoctrination in practice and procedure.

The teacher of drafting today has either a major or a minor in industrial arts. The course of study is such that the teacher has a sound foundation in both shape and size description as applied to representational drawing. Some colleges and universities require courses in advanced projection and teaching methods.

The aim of the teacher in advanced courses is to implement the students in the class so that they can take a job in any industry as a detailer and later as a layout or design draftsman. With the wider adoption of American Standards of Drafting Practice and Procedure, the training and indoctrination period is greatly reduced no matter what kind of drawing is involved.

Persons qualified to teach drafting on the two aforementioned levels are difficult to secure because they can earn more working in industry as detailers or layout or design draftsmen.

Particularly valuable are the teachers of drafting who work in the industrial drafting areas during their summer vacations, thereby keeping abreast of the field and then integrating new standards and practices in their teaching. From the classrooms of these teachers come the apprentices who later become industrial draftsmen. Through home study and guidance by the chief draftsman, a student who has a sound schooling can become a qualified detailer, layout man, or tool designer. His know-how, plus a knowledge and understanding of handbook data, enables him to do drafting on a wider and higher plane than someone not so qualified.

Another point to consider is that many of our industrial-arts teachers originally started to study engineering, but transferred to industrial-arts education. Contact with the field of engineering has given this group an insight into the relation of industry and industrial education. The result is that a teacher with some exposure to engineering will do a better job than one who has had only formal instruction in drafting.

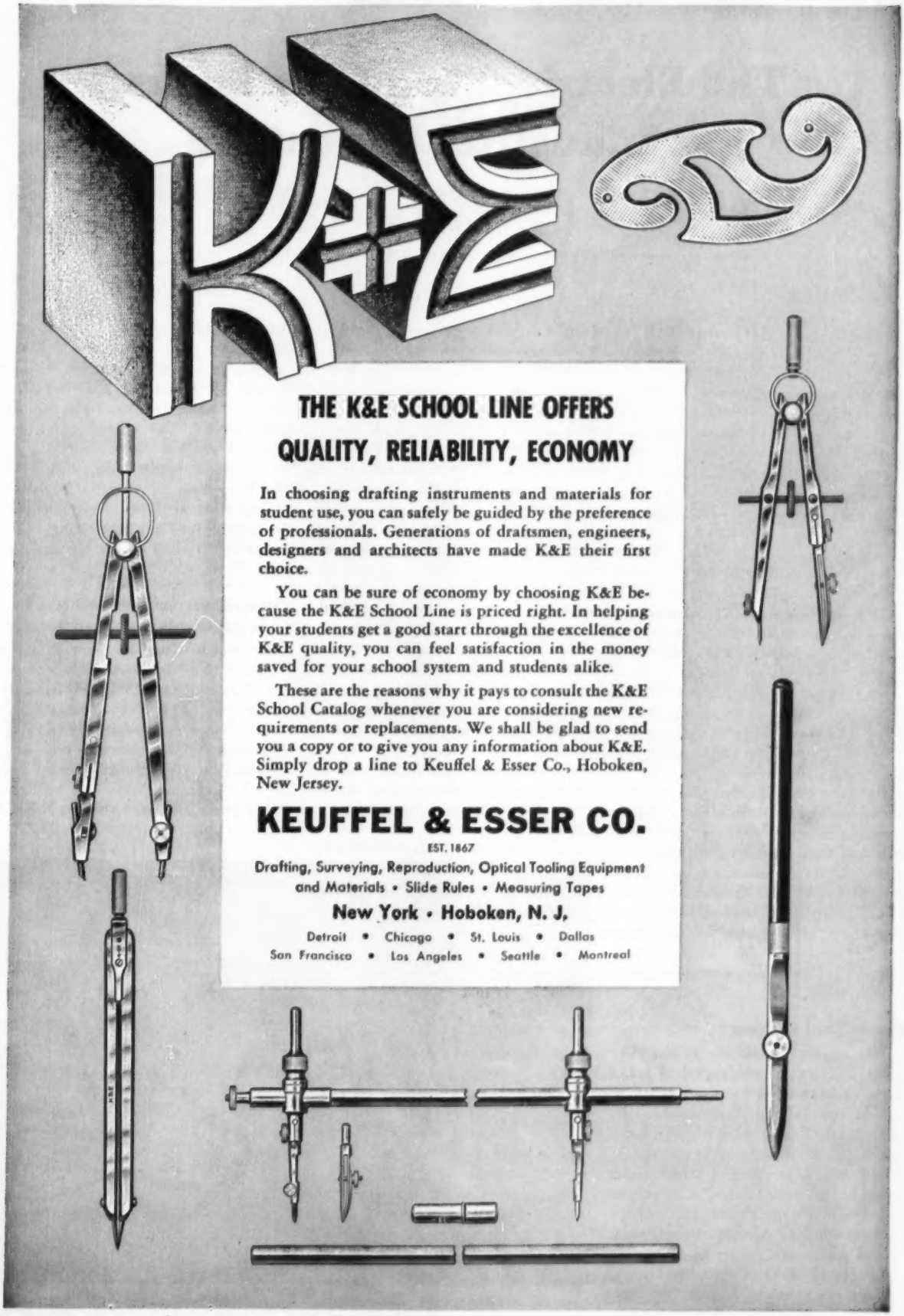
A facet of industrial drafting that is commanding attention now is the reduction of study time that engineering students have in the drafting laboratory. The feeling is that engineers need only to be articulate in terms of reading and speaking the language of the engineer. In many colleges and universities, there is a marked de-emphasis on the teaching of engineers to write the language of the engineer. Fewer and fewer graduate engineers ever spend much time on the drawing board. If any time is spent, it is during their training period and then only to acquaint the individual with practice and procedure. In the light of this situation the question arises: Where will our future draftsmen receive their training? The statement that, "old draftsmen never die, they just draw away," is not true. So who will supply the replacements for these vacancies?

Our high schools can play an important part in training our future draftsmen by expanding facilities and employing top-flight teachers. Qualified teachers must be trained by our colleges and universities. Another source is on-the-job training whereby a person with considerable drafting experience can teach in our vocational schools and, under supervision by the state vocational-education department, can become certificated even though he does not have a degree.

Industry may have to assume a greater responsibility in training draftsmen for the future. Here there are two approaches: Cooperative programs can be established by the local schools in which industry and vocational departments set up and conduct classes in drafting practice and procedure. Or either industry or the schools can take on the job individually, with liaison between them on points of course content and methods of teaching. In the latter arrangement, the local school will teach the basic material that will enable the student to readily grasp the advanced work covered in the program directed by industry. In other words, industry will process the rough casting so that it will fit and function smoothly in the completed assembly.

A further look into the not too-distant future reveals another concern. Will the future draftsman be required to have only a thorough knowledge of representational drawing or will he be required to have formal instruction in the graphical-solutions area? Graphical solutions as related to nomography, graphical calculus, and vector analysis are coming more and more into the picture. Here again is the problem—who will teach this advanced package?

One thing is for sure, if future manpower needs are to be filled, the schools should be deeply concerned. They are the source for the raw material. ★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Here are some practical suggestions to shop teachers as

The Electrical Industry Looks at Industrial Education

By Herbert E. Cook

Executive Secretary, Electrical Association of Detroit, Michigan

Herbert E. Cook

TO advocate a definite formula for educational institutions to carry out on behalf of the electrical industry would not only be presumptuous but impractical so this discussion will assume two phases:

1. What can be done in public schools to alert students to the importance of electricity to them?

2. What can be done in public schools to better prepare students interested in entering the electrical field for future careers?

We fully appreciate the many difficulties encountered in arranging curriculums for various grades in schools. There is not only the responsibility of developing the "thinking powers" of individuals, but also the goal of providing useful information in an understandable manner within a prescribed period of time. Moreover, we must recognize the ever-present student objection, "I'll never use that so why learn it?" We can hazard a guess that almost everyone at some period in his education has expressed this viewpoint. Our only answer is, "Experience has taught us differently."

People Need to Know

This applies specifically to the electrical industry. Over a period of many years we have experienced an appalling lack of knowledge of basic information on the part of the public. It is this basic knowledge which can serve as protection to life, property, and health which concerns us. The technical problems and details are the responsibility of the engineers but knowledge of the fundamental ABC's can render an invaluable service to all users of electricity.

When we consider that electric service has been extended and is continually being extended to millions of users of all classes and ages, we believe it is justifiable to familiarize them with facts which will not only insure good service, but safe use. It is reasonable to assume that most children of school age are users of electricity. At an early age, they turn a switch for lights or run electric trains, or plug in various pieces of equipment. Consequently, they become so accustomed to electric service that it is as commonplace as the rising and setting of the sun.

So we pose the question, "Are we not justified when we urge that educators give some attention to explaining certain facts about electricity?" In addition cannot we consider this information as an essential part of a curriculum because 99 percent of our youth will use electricity more and more as they advance in years?

Electricity and electrical apparatus for light, heat, power are great servants of mankind. Through proper use, they have become a cornerstone of modern living. No other agent can be used in such a vast variety of fields with less trouble, less danger, and less inconvenience when basic principles are properly applied. The relatively few accidents or property losses created by electricity occur in the main when abuses are heaped on the electrical equipment. A reduction in these undesirable events is possible and the total reduced to a minimum if users have a few important facts at hand.

Suggestions for Presentation

From this viewpoint we offer suggestions which should be useful to all students — those in general shop as well as in trade courses. Simple demonstrations can be used to illustrate volts, watts, amperes, circuits, fuses, circuit breakers, and wire sizes with relationship to load-carrying ability. These should not be technical. Volts may be likened to pressure, amperes to the load "pushed

Electrical students running motor tests at a vocational high school. With electrical consumption doubled in the last ten years there are great possibilities in the electrical field.

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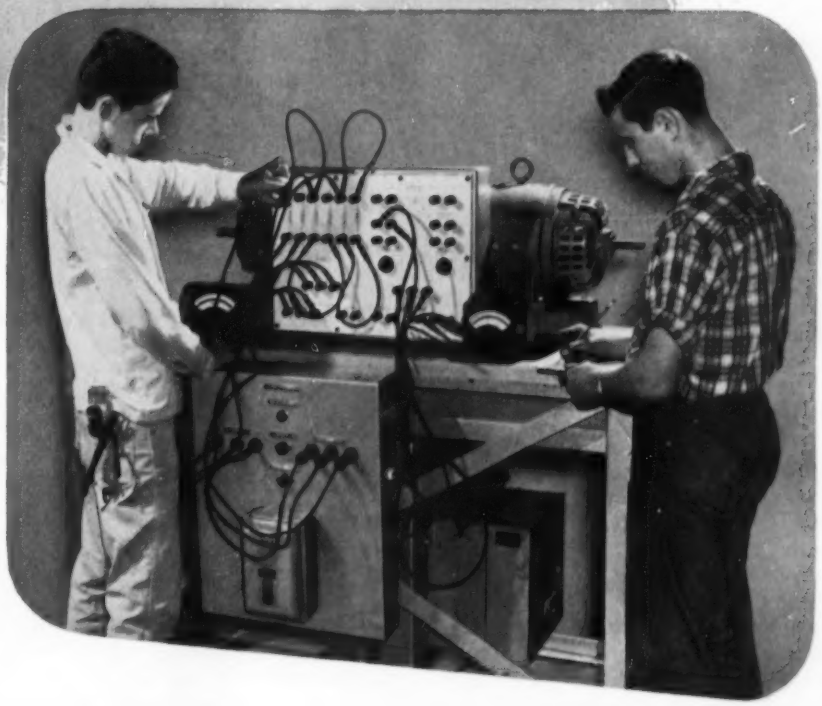

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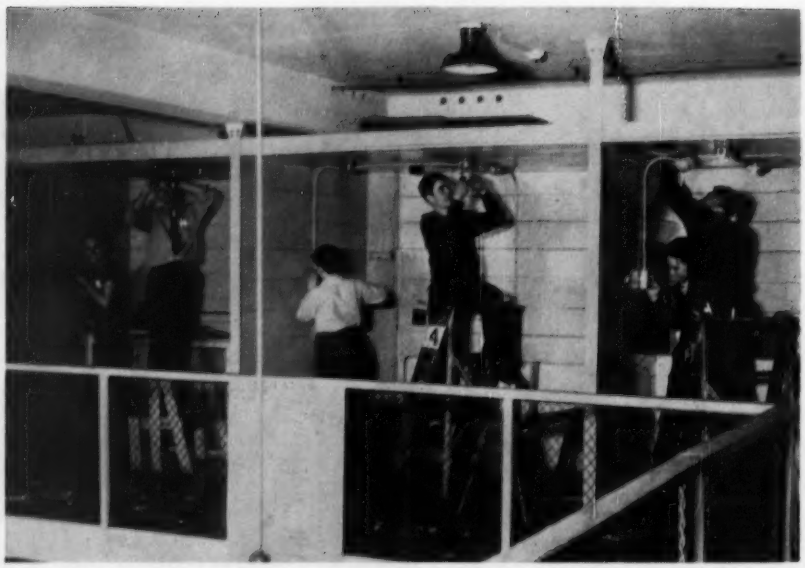
through" the wires, and watts to the energy measurement or "work done" pushing the load through at a certain pressure.

Circuits and service may be likened to a tree. The trunk is the service or main lines connected to the entrance wires from the electric utility. Branch circuits are the limbs of the tree "taken from the trunk." The outlets are attached to the circuit. These are the points of utilization of electricity whether it be for switches to turn lights on and off or places to plug in appliances and lamps.

For wire sizes we can continue to use the tree analogy. The trunk (main feeders) is larger than the branch circuits (limbs). As the trunk of the tree is stronger than the limbs, so the feeders are capable of carrying a larger load than the branch circuits. Wires are made in different sizes and rated according to the maximum load to be accommodated. The flow of electricity generates heat in the wire. If too large a load is permitted to remain on the circuit, the wires tend to overheat and may eventually cause a fire with serious consequences.

To prevent this, a protective device known as a fuse or circuit breaker is inserted at the point where the circuit wiring is joined to the feeders. The carrying capacity of the wire, usually designated in amperes, is dependent on the area in circular mils or its size. Protective devices are designed to carry a specific maximum load in accordance with the wire size. For instance a No. 14 wire is permissible for 15 amperes and therefore the maximum fuse to be used is likewise 15 amperes. In most cases No. 14 wire is generally used for branch-circuit wiring. Consequently, no fuse larger than 15 amperes should be used. Violation of this important fact is the cause of many fire hazards. We have found on investigation that many fires supposedly caused by defective or poor wiring are in the final analysis not the result of faulty wiring, but are caused by improper fuses. There is a common tendency when a fuse blows and lights go out to "put in a larger fuse (and in some cases a penny) to keep the lights burning." This is, of course, disastrous and leads to destruction of property and injury to person. When fuses "blow" the first step is to disconnect something on that circuit before replacing the fuse. Unless this is done, the heat generated through overloading the circuit will, in case of a fuse, melt the fuse link or, in case of the circuit-breaker, trip it. In either case the overloaded circuit will automatically be disconnected from the feeder.



Light and power wiring are an important part of the electrician's work. These students are following the National Electrical Code which is the basis for good training in this field.

We believe this type of information with suitable demonstrations emphasizing safety through application of a few simple principles is exceedingly important and beneficial, not alone to the electrical industry in dealing with its customers but to people in their everyday pursuits and tasks. If through our school systems we can bring them to realize that

1. electrical systems are designed to perform specific functions;
2. electrical systems behave like human beings in that overtaxing their strength means a breakdown;
3. electrical systems are subject to normal maintenance the same as a building or an automobile;
4. electrical systems when used properly within their prescribed limitations are free from danger to life and property; and
5. electrical systems can give satisfactory service only when properly installed, then we feel that our industry is rendered a good service.

Even if the students do not pursue advanced courses in electricity this information will always be of value.

The electrical industry can be of assistance to instructors in this endeavor. Our industry has inumerable visual aids on the subjects mentioned. The electric utility in most communities has or can make available to you, films, slides, or illustrated talks on many electrical subjects. Some communities have electrical leagues, associations, or clubs which will cooperate in all of your programs on request.

Trade-Training Needs

Phase two applied to trade or advanced study of electricity involves four primary subjects for consideration. These are:

1. Theory and problems.
2. Practical work with tools.
3. National Electrical Code standards.
4. Legal requirements for licenses.

Theory and problems are very important features. They are most essential to practical work. Over a period of years it has been amazing to observe the lack of knowledge of elementary arithmetic. Possibly some instructors assume this is a function of other teachers. To be sure it is! However, records indicate a great need for more emphasis on use of fractions and decimals. This becomes evident when applicants appear for examinations for licenses. Fully as many candidates are penalized through arithmetical errors as are penalized through incorrect methods. Since ratings of electrical devices are often figured this way, it is imperative that students have this basic knowledge. The decimal point is so important to safety, proper design, and in the final analysis, profit or loss in business, that this emphasis is warranted. So industry feels that fundamentals are the first consideration. Trade students usually expect that the instruction received qualifies them for the field only to find out that simple errors retard them.

The trade graduate may be licensed to engage in the electrical construction field with little delay or many areas may not have legal requirements for licensing. Notwithstanding this fact, how

(*Continued on page* 63)

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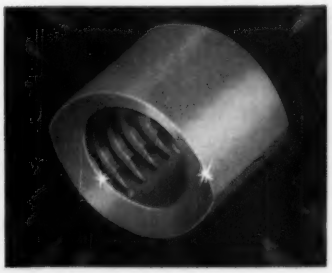

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Industry Looks at General-Shop Education

By Dewey F. Barich

Department of Educational Affairs, Ford Motor Company, Dearborn, Michigan

THIS is a subject made to order for me, since I'm a former general-shop teacher, industrial-arts and vocational teacher-educator, and state supervisor of trade and industrial education. The thoughts and expressions that follow are those resulting from an "over-the-shoulder" look at 18 enjoyable and fruitful years of teaching—all the way from the seventh grade on through graduate school. Experiences in the school shops and classrooms have been tempered with almost five recent years of exposure to a fascinating and dynamic segment of the American economy—the auto industry.

A general observation leads one to recognize a growing awareness on the part of educators and businessmen of the need for close working relationships on problems of mutual concern. It is most encouraging to note the increasing frequency of industry-education meetings and activities. These are many and varied. They may range from a joint committee, planning a career film, to a forum session of college professors and top management discussing the economics of the automobile business. In this atmosphere of better understanding and mutual respect channels of communication are developing through which problems are discussed and solutions eventually forthcoming.

One of the "road blocks" of considerable consequence in the path of improving relationships between educators and the business world is the terminology of the teaching profession. It is true, of course, that most professions have their own peculiar vocabulary. However, it seems to be more noticeable in the language of educators. Perhaps it's because this profession touches so many so often. Let us look at some examples. (These are taken from a glossary of educational terms.)

"*Teaching Unit*," is defined as "A specialization or concentration of content aimed at the partial attainment of objectives found in a resource unit or essential to the needs of a content area. A unit is a specific teaching device directly adhered to. *A teaching unit differs from a resource unit in that the latter serves as a ready reference upon which a teacher draws in preparing a teaching unit.*"

"*Developmental Activity* — Developmental tasks are those activities in the teaching unit or problem situations which involve learning activities for the children, regardless of their nature. The activity is concerned with the definition and identification of the problem, the analysis of data, the drawing of inferences, conclusions, as well as a knowledge of the findings. The problem attack is heavily centered through a well developed procedure. The activities may involve research from among various resource materials, field trips, audio-visual aids, interviews with visiting personalities, correspondence, preparation of written or oral reports, preparation for panel discussions, and many other learning situations."

Now what can you conclude from this one?

"*Contributing Activity*—A contributing activity is a developmental activity, interspersed at psychological moments to provide the maximum integration or correlation of understandings, attitudes, and skills, through various media in the educational environment. Arts, music, physical education, industrial arts, reference work are popular sources for aiding, achieving, and extending the objectives of a resource unit."

On General Shop

What about the terminology of the practitioners in industrial arts, industrial education, practical arts, vocational education, or plain manual training (frequently the best understood by laymen)? This is what we find. "The comprehensive general shop may be defined as a type of organization which provides equipment and facilities for activities in two or more industrial areas. Actually the number of areas represented may vary from two to as many as ten or more. For example, a comprehensive general shop might include experience in woodworking, drawing, metalwork, and electricity. A more extensive development might include such additional areas as graphic arts, ceramics, textiles, leatherwork, and transportation. The limiting factors are the equipment and space available and the interests and abilities of the teacher." We cannot stop here because we have —"Limited general shop has many of the features of the comprehensive type, but the activities and facilities are limited to work with a single basic material such as metal, wood, or to a closely related group or family of industries." When the literature of our profession is examined for objectives of industrial-arts education, we find them expressed in terms "loaded" with high-sounding educational verbiage. This is a definite handicap when one is attempting to discuss the answer to what, how, and why of industrial arts or industrial vocational education.

Imagine what the reaction of an employment official would be if you tried to explain what industrial-arts education was with the definition: "Industrial arts is considered a part of general education not because of an indefinite 'general' nature and not because it pursues objectives which are similar to those of long-accepted 'general education subjects.' Rather, industrial arts is a part of general education because it derives its content from industry—a basic element of our culture—and because it

has as its social purpose the greater understanding and better control of the phenomena of industry."

If the man from industry is still hazy, continue with, "The privilege of being a part of general education carries with it certain great and even grave responsibilities. Furthermore, the general education criterion suggests a unique approach to the determination of objectives. Among the many responsibilities which are implied is the necessity of deriving instructional content from the *many* ramifications of industry. The subject of study should be not only industry in terms of *materials, tools,* and *processes,* but also industry as *science* and *invention,* industry as the *means of producing goods and services,* and industry as a *unique pattern of human relationships.*"

It's Confusing

One can readily understand why communications break down often between education and industry. Before complete and effective understanding can be brought about, a common language will have to be developed. This is particularly true in the areas of secondary education primarily concerned with industry; namely, industrial arts and industrial vocational education.

At best then, "what industry sees when it looks at general-shop education" is pretty hazy and out of focus. It is quite apt to be critical of the results because it does not understand what general-shop education is all about. It is quite likely that industry, generally, would be favorably disposed toward this kind of education if it could be shown that general-shop instruction has a preponderance of desirable results, usable in industry. To date, it must be said, there is very little objective evidence to support the contention.

A careful analysis of claims for the general shop may reveal some shortcomings, at least in some such industrial-arts teaching situations. There are those industrial-arts educators who subscribe to the philosophy which advocates the maximum number of instructional areas, limited only by "equipment, space, interests, and abilities of the teacher." To many in industry, including some who perform production miracles, this would seem like an impossible order; particularly if one was to do a "quality control check" on the educational results. Another look at general-shop education may show up the teaching situation where much of the class time is taken up in discussing anything from the economic effects of our immigration laws to the social implications of repairing an extension cord. Then there is the unique general-shop teacher who is strengthening the "content" of the "textile unit" by teaching the boys how to sew patches on their pants.

When these ninth-grade boys of James Monroe Junior High School, Seattle, Washington, taught by J. S. Turnbull, complete their woodworking course they will have acquired an admired skill.

Although these examples may be extremes in industrial-arts pedagogy, nevertheless it is an indication of why general-shop education is not understood by industry. Incidentally, this lack of understanding exists among many educators as well. There is obviously a need for simplification of terminology.

Industrial arts, through the general shop and other forms of instruction, can improve its contribution to the total program of education and thereby aid *all* segments of our economy, including industry. Here are some suggestions on how this may be implemented by teachers, supervisors, and teacher educators concerned with industrial-arts education:

1. Reexamine the objectives for industrial-arts education in light of *present* and *foreseeable* industrial practices. A technician working on a nuclear reactor was recently overheard remarking, "Some technical teachings are 200 years behind the times." "We ought to 'telescope' content so as to make room for today's and tomorrow's ways of doing things—as characterized by the atomic age." This same technician said, "Most of my problems are basically shop problems—I wish now that I had more training along this line." (This technician had several degrees including a Ph.D. in physics.)

2. Establish and maintain an open communication channel to the industries over the largest area possible. Technological changes are taking place in industry at such speed and with such rapidity as to be almost unbelievable. If serious attention is given to this suggestion, there will be little time for spreading the professional effort all over the "educational map."

3. Seek counsel, advice, and aid from industry in planning your program.

4. Get acquainted with the technical publications and "trade" associations of the major industries in your geographical area.

5. Learn to speak and understand the language of industry. This comes about through constant association with, and participation in, its ways.

(*Continued on page* 70)

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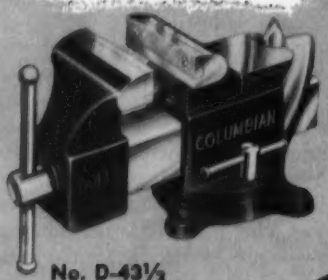

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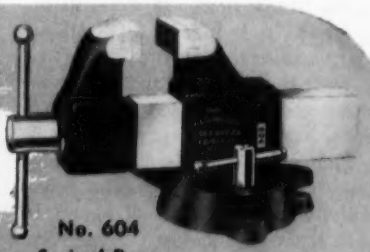

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This year, Ford is encouraging and assisting in the sponsorship of Student Craftsmen's Fairs all over the country. These Fairs will serve as local "showcases" for IAA entries, and as recognition-getters for participating students and teachers. Already, Fairs are scheduled for Philadelphia, Long Beach, Greensboro, Miami, and London, Ontario. There'll be others, too. If no Fair is planned for your area, we'd be pleased to help you get one started. Free promotional assistance is yours by writing us at the address below.

Fairs must be over in time to ship entries to Salt Lake City or Dearborn *for the national IAA competition.*

Projects must be RECEIVED by these days:

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IN
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Receiving station for projects made in Montana, Wyoming, Colorado, New Mexico, and states further west.
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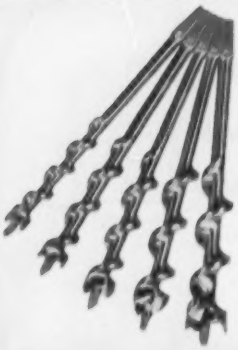
Receiving station for projects made in all other states.

If you have not received your IAA rules booklet and entry blanks, write:

FORD INDUSTRIAL ARTS AWARDS • 3000 Schaefer Road, Dearborn, Mich.



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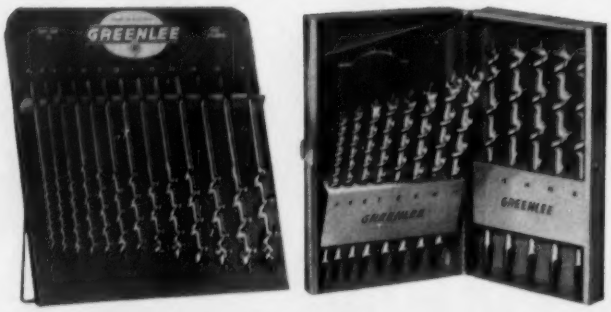

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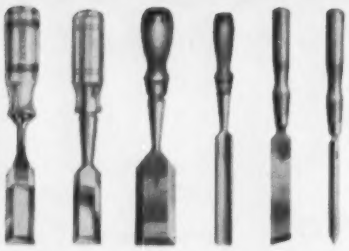

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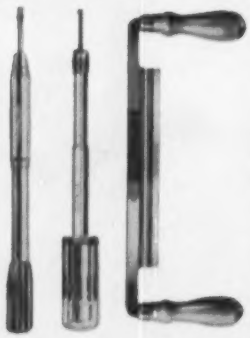

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More training on a broader base is called for when

The Graphic-Arts Industry Looks at Industrial Education

By Raymond Blattenberger

Public Printer of the United States, Washington, D.C.

Raymond Blattenberger

WHILE recently reviewing an economic presentation of the graphic-arts industry, I noted that in 1850 there were approximately 14,000 people directly engaged in printing and related occupations. Based on today's dollar, they turned out a production valued at about $85,000,000. Now, a little over 100 years later, those 14,000 people have grown into a work force in the graphic arts and related industries of over 800,000 and the products associated with the graphic arts are valued at more than eight billion dollars.

I think it is significant to note that the number of persons associated with the graphic arts has increased 60 times in 100 years, while the population was increasing only seven times. It takes only a moment's reflection to consider how each human being in our nation today requires so much more printed material than he did years ago—even our children starting kindergarten use a much greater quantity of printed products than was ever dreamed of 100 years ago.

The shorter workweek has brought more leisure, with its increased opportunity for reading and recreation, all of which involve the use of printed products. The tremendous number of inventions and the new developments, each of which require great quantities of sales literature, instruction literature, and other printed material, are all part of a national pattern in which the graphic-arts industry constantly plays an increasingly important role. The facts, then, clearly indicate a strongly increasing demand for the products of the graphic-arts industry.

New Blood Needed

A recent survey of manpower needs shows that in the large segment of the industry which was surveyed, there was not a sufficient number of men in training to take care of the normal losses from death, retirement, transfer out of the industry, and the usual causes which drain off an industry's manpower. The industry has a disproportionate number of workers *over 65*. The average age is much higher than it should be. These facts indicate clearly that there is going to be a constant and increased need for people to go into the graphic-arts industry, and the indications are that the need will greatly exceed the present rate of influx. The industry needs new blood at every stage of production and management. This condition varies, obviously, depending on needs in local areas, but I understand that a number of local manpower surveys have supported this same finding.

What, then, is the part of graphic-arts education in this picture? And what are some of the trends that we can see on the horizon which are directed to the industry and the school system alike?

One of the most interesting current developments, I think, is in the attention that is being given to recruitment. The U. S. Employment Service, working in cooperation with the industry at a national level, is constantly developing new materials on aptitude testing. There was a release issued early in June setting forth some of their latest findings.

The Graphic Arts Education Council is publishing a book for guidance counselors. It will incorporate the latest information on aptitudes in the graphic arts. Even more important, it will also present a description of what might be called the commonsense characteristics by which teachers, who have not had training in aptitude testing, may readily know how to identify the qualifications of the students who come under their surveillance. After all, a pupil spends 12 years in the school system. During those 12 years he has pretty thoroughly revealed to his different teachers his character traits, his natural abilities, his inclinations, and his desires. I don't know how many schools are doing a scientific job of cataloging this information, but I am told the Education Council is now cataloging for the schools the characteristics which are desirable for personnel in the graphic arts. We are also beginning to reap the benefits of individual case histories from companies which have employed personnel on the basis of aptitude testing.

What does all this mean in terms of graphic-arts education? It means that we are in a better position to help and direct the type of young person who is qualified to find his life's work in the graphic-arts industry. It should help to disprove the too-often-held theory that the graphic arts is just one of the catch-all industries which doesn't necessarily appeal to the better student. It should end the nonsense that the printing industry should be willing to take only the boys and girls who have a low or average IQ or are lacking in ambition and other desirable traits.

Now there is another objective in graphic-arts education in schools which is not directly related to vocational guidance. This is to provide background information for people who will go into the industry. We in the industry would call it "consumer information." In the school system, I believe it is generally termed "industrial arts." We don't think it strange when young ladies are taught domestic science, when young men are given training in a woodworking shop. We think that these are things they are going to use in everyday life when they leave school. Therefore, it is quite normal and natural for them to become familiar with activities that everybody is likely to get into.

Can anyone reading this imagine a person who is not at some time or other, during the course of a lifetime, going to depend on the effectiveness of a piece of printing to gain an objective? Printing is so important in our lives that at some stage we all become authors or

printing designers or buyers of printing. Certainly, we are all users of printing. The man or the woman in the office depends on the effectiveness of the business forms he or she uses—usually many different business forms. Success of the salesman is affected by the quality and the presentation of the printed piece. As a matter of fact, *all* business is affected by the quality of its printed advertising. If you just think about the various occupations, you can readily imagine a time in the course of that occupation—usually many times—when success will depend on the effectiveness of printing. Certainly, you all agree that in education itself the effectiveness of the instruction material, the accuracy with which it is presented, and the simplicity of the illustration greatly facilitate the training.

Future management, teachers, artists in design? These youngsters may fill tomorrow's great need.

The Challenging Future

Now, that's the part, in my opinion, that the industrial-arts courses play in our future life. Telling the students how and why the design of the printed piece is important to its effectiveness, showing the different treatments of typography and what that means, giving them a speaking acquaintance with the graphic-arts processes, beginning with mimeographing and going up through the most elaborate printing, so that they have a working understanding, not as trade training, but to familiarize them with a tool that they will often use in later life. Can anyone say that this is not a challenging future for instruction in the graphic arts? Can anyone say that the graphic arts does not have a great diversity of occupations and opportunity for training, such as is offered by few other industries? The opportunity for the artists in design, the opportunity for the mechanically inclined in the craft occupations, the opportunity for the creative mind in the planning activities, the opportunity for finance, personnel, management, and business administration? I think every liberal-arts college should give a course in the history and background of printing so that college people will have a better idea of the possibilities open to them in the industry as well as this knowledge of printing as a working tool.

There is a big job ahead for graphic-arts education. I am enthusiastic about the fact that we have at last reached a point where, under the sponsorship of the Education Council and the International Graphic Arts Education Association, we have industry and school people working together to build an education system in the graphic arts, the like of which does not exist to service any other industry. No other industry is more deserving, and I doubt if any other offers greater opportunity to the people who are engaged in teaching it.

Except for a few institutions like Carnegie Institute of Technology, most of the graphic-arts training now being done is at the vocational high-school level. Fortunately, the need for higher teacher pay in public schools is being recognized, and salaries are beginning to reach a point where the sacrifice required of printers who love to teach is somewhat lessened. On the other hand, industry pay scales are going up, too. This presents a problem for the industry. A way must be found to convince the school boards and commissions that competent teachers cannot be paid less than journeymen wage scales. Neither the industry nor the states and cities have a right to expect that their graphic-arts teachers will work part-time at the trade or teach part-time in order to make a living commensurate with their knowledge and training. In my opinion, the graphic-arts teachers have been subsidizing the school system long enough. The magnificent job they have done merits more consideration and I believe most earnestly that it will be coming. I know you can count on the printing industry to help bring it about.

Train for Management?

I see, too, a prospect of broadening the base of graphic-arts instruction, because there is a widespread demand for more training at college and university levels—training for management as well as for the shop and personnel closely related to the shop. The rapidly expanding newer processes call for scientific and engineering instruction that the public high schools can hardly be expected to provide. Herein lies further opportunity for experienced instructors who can learn as well as teach. The extension of industrial education into college-level teaching is not an unheard-of phenomenon, and I am convinced that the movement will grow. Some colleges are already giving courses in typography in connection with art or advertising classes.

The participation of industry leaders in educational aspects of our business will increase rather than decrease the requirements for professional teachers in the field. And when graphic-arts leaders get into teaching activities and learn some of the problems, it can hardly fail to enhance the prestige of the professional teacher.

I hope to see the prestige of graphic-arts instructors further increased by a greater emphasis on, or tie-in with, educational methods at our outstanding schools of printing so that we will have higher professional standards of instruction. This hope is born in my strong belief that there is a place for printing-school graduates in the graphic-arts teaching field, as well as in production and management.

This is a great industry in which we are engaged, one that deserves the best efforts of all of us. It is so essential that we must always keep our standards of quality and production at the highest possible levels. The various trades have become too involved, too complex, too scientific for the oldtime training and apprentice practices to produce the men we need.

When you work in a printing office, you are helping produce something that nobody in this civilized world can get along without. Since printing is so necessary to modern ways of living, it follows that all who are engaged in helping to produce it are doing equally indispensable work.

Our Heritage

There is a very direct relationship between the teaching of the graphic arts and the welfare of the individual, the state, and the nation. Printers are at last awakening to the realization of the responsibility that rests on them to furnish to all branches of our government, to industry, trade, commerce, education, communication, religion, and nearly every other human activity, the tools and supplies in the form of the printed word that are needed to promote their continued progress.

Printing has always played a part in

(*Continued on page 62*)

train them on the tools industry uses...

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You can drill your students, BUT...

Industry will waste time training your students, if they haven't learned their skills on the tools industry uses.

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Are our students being prepared for the complexities of today's working standards?

The Machining Industry Looks at Industrial Education

By Urwin Rowntree

Director of Education, Brown & Sharpe Manufacturing Company, Providence, Rhode Island

WE live in an age of automation, digital computers, radar, transistors, guided missiles, atomic and nuclear energy, hydraulics, electronics, and many such developments. If these are a part of the life of today and if education *is life* (and not "preparing for life") what are vocational and industrial-arts educators doing to adapt their teaching so our young people will really begin to understand how complex life is today?

Industry Today

What is happening in the machining industry today in relation to a few years ago? Technically, the industry must keep up with ever-changing needs and developments. To remain competitive each company must be alert to the need for improved design, better production methods, plant- and work-layout changes, new ideas in materials handling, and current trends in quality control. Production control must steer parts and components through the plant so as to cut down inventory and have the right part at the right place at the right time.

Saleswise, market research and advertising are not only an art but a must if a company is to remain competitive. In this connection, business trends must be known, competitors and their products analyzed, plant and production capacities understood and then followed by a sharpening up of the sales team for an all-out sales effort.

As for the financial phase, it is always necessary to use the latest techniques in analyzing cost — for a business dies unless it is cost conscious. Industry is aware of the need for a daily new look at its systems—inventory control, purchasing, credit, correspondence, supply and customer services.

Then, there are people—the heart of any company—for because industry today is people-minded the focal point of design, manufacturing, and sales is not only on the machine but it is also on the craftsman, supervisor, and executive. Management knows that people are different—physically, mentally, and emotionally—and management is constantly searching for new techniques of recruiting, selection, and the development of human resources.

The whole field of employe and executive development is always under careful scrutiny, for each individual plays such an important part today.

Human relations, as important as it is, is but one facet of any employe developmental program. Among other employe needs to be met are good labor relations, educational programs for upgrading purposes, employe services for medical, recreational, and other individual and group needs; in addition, other programs are needed to improve morale and to bring about positive worker attitudes.

The area of business economics is all-important, for each employe—lathe operator to the president—must have an understanding of how and why the business operates as it does. More attention is being given to communications—up, down, and across—because industry knows that people who are well informed do a better job; emphasis today is on the principle of human feedback and much is being done on developing people on face-to-face communications. So much is also to be done in teaching people how to express themselves, to listen intelligently, to write succinctly with meaning, and to understand the field of semantics.

The Needs of Industry

If America is to hold its position of world leadership, schools, colleges, and universities must face up to their responsibilities in our society. People are needed who are creative, analytical, imaginative, skilled, informed, and broad-gaged enough so that they can work, play, and live together. Industry needs chemists, engineers, physicists, skilled craftsmen, engineering aides, machine operators, and hundreds of other types of people—all products of our educational system in this country.

Take engineering as an example: The National Association of Manufacturers Research Committee in a recent survey found that the United States presently has an unfilled demand for 50,000 additional scientists and engineers. Moreover, we need 50,000 trained persons annually, but we are graduating only 40,000. The shortage of scientists and engineers begins in our elementary schools. Look at the business section of any metropolitan paper and note the job openings going begging for want of capable people. Or travel with me on an annual junket to the university campuses searching for young talent who have capabilities of growth.

This picture can be painted in many other fields. What is automation doing to job needs? In a recent trip to an automobile manufacturer in Detroit, I found many types of new job openings. We need better craftsmen, more machine maintenance people, more engineers, and many more people with skills in between the craftsman and the engineer. And well-informed vocational teachers know how apprenticeship is on the decline.

What are vocational and industrial-arts educators — teachers and administrators — doing about this problem? Are they sensitive to the needs of industry today? Are they aware of new concepts and the competitive nature of industry? Do they modify their curriculums so as to be in tune with life today? Do teachers keep up with developments in their own trade or area of interest?

As a former industrial educator I have often found well-meaning people from industry telling what was wrong in the schools. Many of their criticisms were sound — some were questionable. Industry itself could well afford to listen to others, too, for all is not perfect there. It has been a personal privilege, however, to assess both education and industry — and to raise some doubts about certain school practices. Follow-

ing are some thoughts to ponder about:

In Vocational Machine Shop

1. Industry is transferring hand skills to machine skills. There is much less filing, scraping, and fitting. Do you have students chip and file cast-iron blocks for squareness and flatness? Why?

2. How are you instructing on the use of cutting tools? What about today's industrial practice of gang tooling? The use of carbide tools? New lubricants and coolants? Increased speeds and feeds?

3. What about the newer approach on electronic measuring devices? Where do you stand on measuring with instruments other than the scale, vernier, and micrometer?

4. How much do you teach about the principles of work simplification? *Why* is the job done that way? *Why* is each detail necessary? *How* can we eliminate operations? *How* can we combine operations? *How* can we rearrange operations? *How* can we simplify?

5. What about your teaching jobs? Are they real, worthwhile, useful, and productive? An ingenious instructor can find jobs — even for beginners — other than plumb bobs, screw drivers, and steel hammers.

6. What about your trade theory? Are you teaching about current industrial practices? Do you go on field trips with a purpose? Do you invite industrialists in to talk with you and your students? Do you make use of craft-advisory committees? Do you occasionally take a summer off to work at your trade?

7. Do you encourage the related instructors to follow industrial practices in related drawing? What do they know about the current industrial simplified drawing approach? Are we still putting too much emphasis on inking drawings? Why?

8. What is the general-education (vocational) teacher doing about technical report writing? Teaching students to think and speak on their feet?

9. Can the related mathematics instructor do something about apprentice applicants who fail basic mathematics entrance examinations? Should we always blame the elementary schools?

10. Could something be done about the development of analytical thinking? Much is being done today in industry to develop the imagination and creative talents of people.

11. How about more instruction in business economics? Principles of automated production? Cost analysis? Systems of industry such as quality control, production control, and work and plant layout?

12. When did you rearrange your shop layout last? Is your tool grinder close by the lathe section or does it look better in a corner by itself?

13. Are we developing short unit courses for those students who enter industry as machine operators? Do you encourage the youngster with engineering talent to continue his education in a technical institute or college?

14. When last did you revise your course of study? Did you "swivel" chair it? When did you visit industry last? When did you visit your related instructors last?

15. Industry is doing much about preventive maintenance of tools and equipment. Do you wait until a breakdown occurs or should you have a plan of rotated preventive maintenance?

In Industrial Arts

Many of the questions raised for the vocational-shop teachers apply to industrial-arts teachers. Keeping in mind the objectives of industrial arts, however, some thought can be given to the following:

1. Since we have such a shortage of scientists and engineers, are you spotting the youngster with outstanding talents? Do you encourage him (or her) to find out more about these fields? More women are entering these endeavors now.

(*Continued on page 64*)

To meet competition, industry must keep up with ever-changing needs and developments. As technical changes are made, employes gain new skills, and the consumer benefits in better quality products. Here, left, an apprentice machinist learns on real work. Below, a multi-tool set-up.

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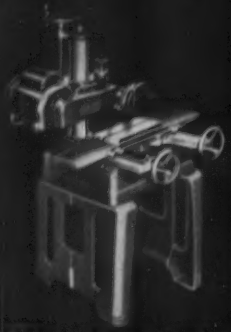
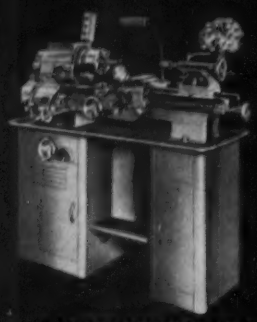


GRINDERS: Toolmaker Grinder, Standard Surface Grinder, Chip-Breaker Grinder, Tool & Cutter Grinder



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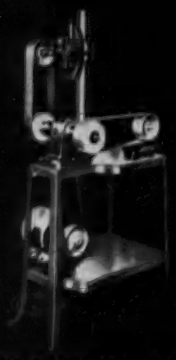

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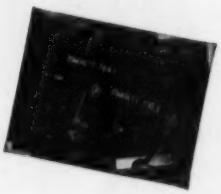

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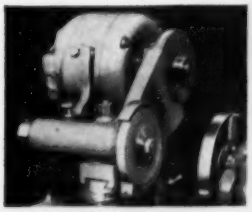
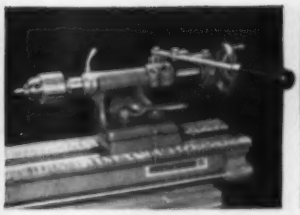
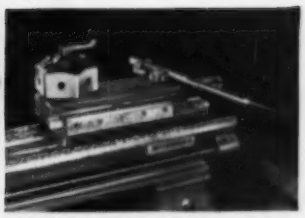


External Grinder

Milling Attachment



Handlever Tailstock

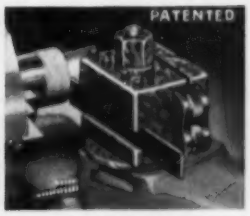


Handlever Bed Turret

Telescopic Taper Attachment

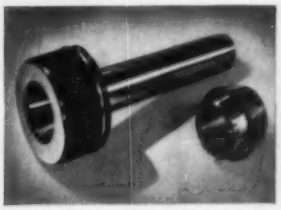
Handwheel Collet Attachment

Handlever Collet Attachment

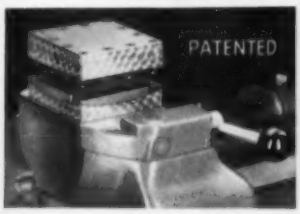


10 in 1 Tool Holder

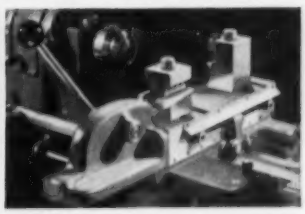
Ball Bearing Live Center



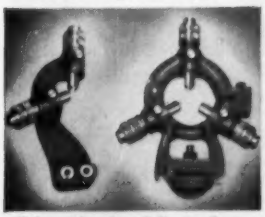
Adjustable Collet Bushing Chuck



Square Turret Tool Block

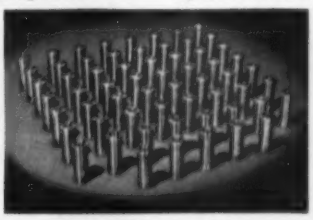


Handlever Double Tool Cross Slide



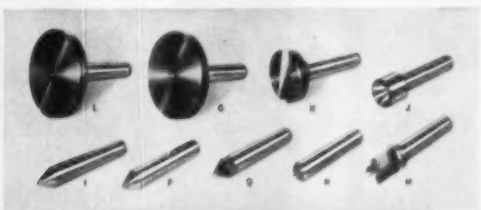
Telescoping Jaw Follower Rest and Center Rest

Collet Rack



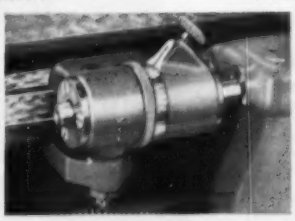
Steel and Brass Collets

Step Chucks and Closers

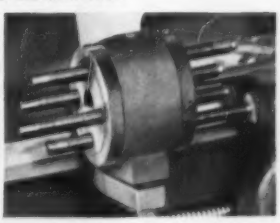


Centers and Drill Pads

Thread Indicator



Micrometer Carriage Stop



Four Position Carriage Stop

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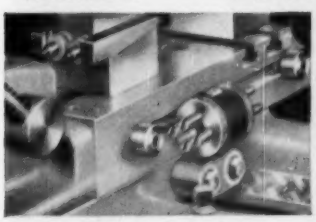
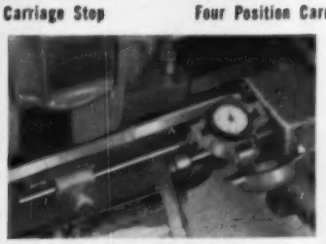
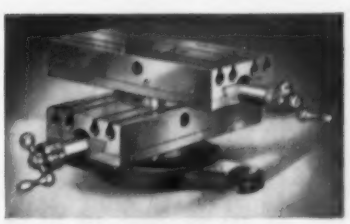


Four Position Cross Slide Stop



Dial Indicator Carriage Stop

Coolant Pump



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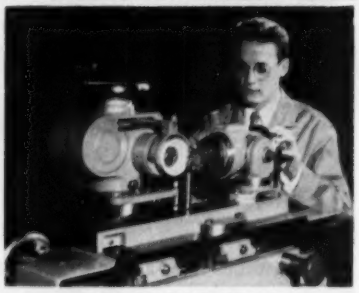
CINCINNATI No. 1 Cutter and Tool Grinder. Catalog M-1852

*Surface Grinding Attachment. Extra equipment. †Cylindrical Grinding Attachment required. Work is ground dry.

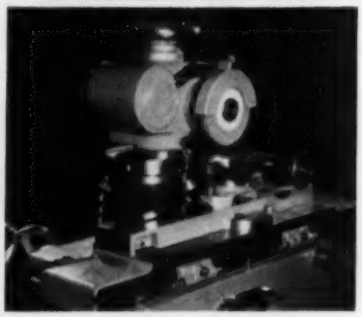
Grind lathe and planer tools*



Sharpen shell end mill cutters

Sharpen stagger tooth cutters

Cylindrical grind diameters†



Grind flat surfaces*

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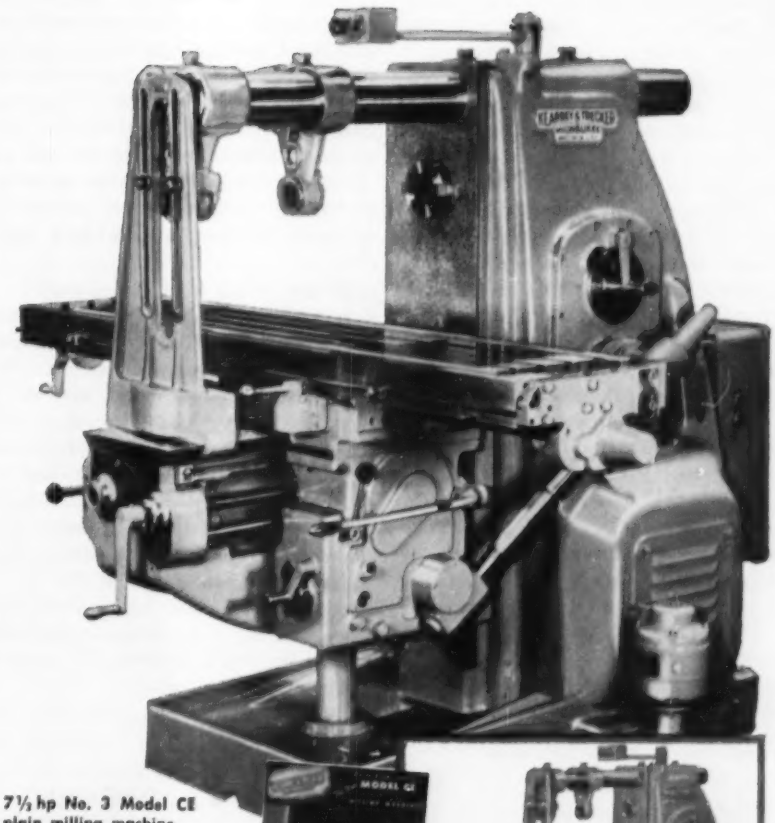
For the full story, contact your nearest Kearney & Trecker representative, or write Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.



7½ hp No. 3 Model CE plain milling machine
NOTE: Standard equipment includes choice of only one arbor support. Overarm brace available at additional cost.

Free Catalog! Ask for complete data on Model CE milling machines, catalog No. CE-10. Also see our catalog in Sweet's Machine Tool File.

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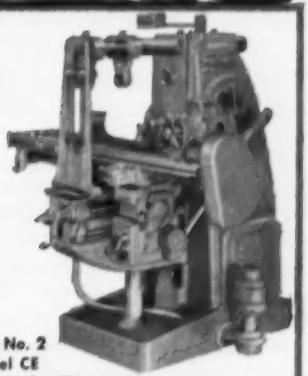


3hp No. 2 Model CE universal milling machine
NOTE: Standard equipment includes choice of only one arbor support. Only Conventional Lead Attachment (shown above) is available in Model CE Universal machines. Overarm brace available at additional cost.

Some practical suggestions for the student and the school as

The Sheetmetal Industry Looks at Industrial Education

By Hugh B. Reid

Engineering Department, Ford Motor Company, Ypsilanti, Michigan

THE demand for more and better products for the comfort and convenience of the American consumer has been a constant challenge to American industry to develop and produce many new products in sheetmetal.

Industry has met this challenge by replacing the old pot-bellied stove with a modern central summer-winter air-conditioning system, replacing the warped wood storm door and storm window with attractive nonwarping sheetmetal products, and producing garbage disposals, refrigerators, kitchen cabinets and other household conveniences too numerous to mention.

In the office, the wooden file cabinet has been replaced by the metal file cabinet, and the modern desk is now constructed of sheetmetal.

In every mode of travel, sheetmetal products are conveying passengers by ship, by airplanes, by cars and bus, and by rail.

These are but a few of the contributions which American industry has made to the economy through the development of use of sheetmetal.

What the Future Looks Like

Owing to the malleable and ductile characteristics of sheetmetal which make it possible to press it into almost any required shape at a very low cost, products now made on the mass-production basis from wood and fibers are potential products for sheetmetal industries.

You do not have to look too far into the future to see decorative sheetmetal cabinets replacing wood for radio and television appliances, more insulated sheetmetal panel siding being used in building construction, and sheetmetal stainless steel sheets being used in an increasing amount for decorative purposes in commercial and industrial building.

With the introduction of atomic energy and its greater energy and heat, sheetmetal will find extensive uses in wind tunnels and duct system construction for testing new products. In the ever increasing push-button automation machines, sheetmetal will play its role as chutes are required to transfer parts as they pass to the different points of operation on their way to final completion.

To the enterprising young man who is looking to sheetmetal for a business opportunity, let us begin with the building-trades. Every new house has approximately 100′ of gutter and about the same footage of down-drain conductor pipe. This material and the required accessories can be purchased in finished fabricated lengths from a wholesale house. A knowledge of measuring, the development of simple elbows, the techniques of soldering and the use of hand tools common to the sheetmetal trade, a truck, and a business telephone will be the initial requirements to get a small business started.

Many who have begun in this way have branched into the installation of furnaces and on into commercial and industrial sheetmetal installations.

In the design and engineering field of sheetmetal, the opportunities are legion. An automobile is the design of a quantitative number of sheetmetal component parts which, in assembly, will fit together as a unit. Each part must first go to the design engineer, next to the draftsman, then on to the sheetmetal experimental shop where a number of sample cars are hand made. This identical method is used in the development of refrigerators, cooking stoves, and numerous other sheetmetal products.

In the industrial field the heating, ventilating, and air-conditioning engineer designs systems for homes, stores, commercial buildings, and industrial buildings. The design figures are passed along to the design and detail draftsman who makes the necessary drawings for the fabrication and installation of the various systems. The field is wide open and crying for young men who will invest their time to acquire the necessary knowledge to meet the requirements.

The opportunities in supervisory work in the sheetmetal field are excellent for the man who will acquire a working knowledge of the theoretical and practical skills connected with the particular phase of sheetmetal work in which he is interested.

Suggestions for Industrial-Arts Sheetmetal

Training films can bring many experiences to boys in classrooms. Here they can see the practical operative skills practiced by the various trades being performed by trained workmen, and the hand tools and machine tools which are common to the particular trade as well as the environment in which the men have to work. Industry has many educational films of this nature which are available to educational groups at no cost.

Guided tours can be arranged for student groups to visit almost any type of manufacturing plant where first-hand information can be gathered on the manufacture of consumer goods and the various trade skills and hand and machine tools necessary to produce the product from the raw material to the finished goods.

Trade, industrial processing, steel production, and school-shop magazines are all available in which are presented articles dealing with the various phases

of skill, both practical and theoretical, and also advertisements in which related trade machine and hand tools and their application are given.

These are but a few of the many sources of consumer knowledge available to students in quest of trade-skill information as guidance in the choice of their life vocation.

Hobby interests can be developed in the sheetmetal school shop. The Ford Industrial Arts Awards program can stimulate such activity.

Young people located along our coast line, and particularly those living in seaport cities, have an interest in the building of model ships, and on a visit to such cities one will usually find model yacht racing clubs in which the participants are sailing boats of their own construction. Model car building is an activity of interest and keen competition, and model airplane racing has keen interest from Maine to California. Competitors in such events are required to construct their model plane or car. School class projects in the building of cars and planes for entry in such events would have a tremendous competitive interest in local school groups.

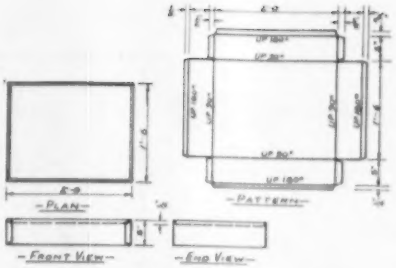
Suggested Teaching Techniques and Needs

Making the student cost conscious at the very outset of his industrial training will teach him to measure the cloth three times because he can only cut it the exact length once.

Then the basic manual work attributes of cleanliness, neatness, patience, perseverance, and selfreliance are of utmost importance for students at the industrial-arts level. Work habits are formed at this stage which could become a life pattern. The industrial-arts instructor should watch and ward well the young lads committed to his instruction at this very important period of their training.

Orthographic projection is always used for workshop drawings in sheetmetal as well as other trades. It presents the object as it actually is, both in shape and size, drawn to the most convenient scale. A simple three-view projection of a tim-plate pan and a developed pattern could be used as a begining project. (See drawing.) This will familiarize the sheetmetal student with a simple, practical sheetmetal drawing and a pattern layout.

Before a workshop drawing can be correctly read, or a sheetmetal pattern developed, a good working knowledge of practical geometry is essential. The bisection of lines and angles, finding the tangent point of a straight line on the



This simple beginning project can be drawn on buff paper and then cut out, folded, and glued together to see if the development fits.

circumference of a circle, dividing a circle into given number of equal spaces, and the construction of lines parallel to each other are basic.

Without a knowledge of these basic fundamentals, the student will have difficulty with any type of sheetmetal project whether it be at junior-high, high-school, or apprentice-training level.

The areas of squares, rectangles, circles and triangles, calculation of the circumference of cylindrical vessels, the perimeter of square- and rectangular-shaped tanks, the volumes and capacities of cube-, rectangular-, cone-, and pyramid-shaped vessels are all common to the sheetmetal trade, and are essential to the accurate performance of work carried on by the sheetmetal mechanic.

In evening-school classes conducted for sheetmetal journeymen and apprentices, emphasis should be put on the theoretical aspect of the trade. The principal courses requested by the shop men are blueprint reading, drafting, trade-related mathematics, and, most popular of all, sheetmetal pattern developments.

The blueprint reading can be substituted for a course in sheetmetal detailing. The drafting course should be worked in conjunction with the course in mathematics in which the student is given some elementary problems in the design of simple ventilation and exhaust systems in which tables are used as an aid in finding air volumes and velocities and necessary pipe areas and diameters.

In the pattern development courses the subject can be presented under four headings: (1) straight-line development; (2) radial-line development; (3) parallel-line development; and (4) development by the triangulation method.

The student from industry is interested in short, practical methods which will give the maximum results in the minimum work time.

Each problem should be presented with this object in view and the students required to analyze each project and develop the pattern using the minimum amount of views and lines to complete the pattern layouts.

Pattern layouts, when worked on buff paper or cardboard, can be cut and formed to the required shapes. This method of fabrication has shop training value and also enables the student to check the accuracy of his work.

Current Needs

In the years previous to World War II, many of our skilled tradesmen came from lands beyond our shores, attracted by the higher wage scale and the much better economic conditions that our country afforded them. Since the end of World War II, most foreign countries are restricting their skilled mechanics in the interest of selfpreservation in a troubled, uncertain, cold-war world condition. The schools now should meet industry's need for qualified graduates to go into apprentice trade jobs. Industry, in turn, has recognized the important contribution the school can make in providing trade-related classroom instruction in apprentice-training classes.

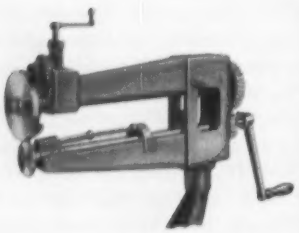
In addition to the academic work requirements, the subjects most necessary to the prospective sheetmetal apprentice are:

1. Plane and solid geometry.
2. Areas of plane figures and weights and thickness of various gages of sheetmetal.
3. Calculation of the volumes and holding capacities of vessels of given dimensions.
4. The first principles of sketching.
5. The compositions and properties of soft and hard solder, and the composition and characteristics of the corresponding fluxes.
6. Characteristics of the commercial acids (hydrochloric, sulphuric, and nitric) and their reactions with the common metals.
7. The principles of projection.
8. The development of simple pattern layouts.
9. A basic understanding of blueprint reading and drafting.

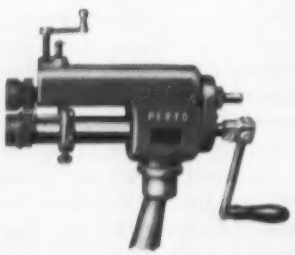
In the new atomic, automation age just ahead, with its push-button war and assembly-line techniques, the schools and colleges must play a major role by producing young men with the basic knowledge in the skilled trade and engineering fields who will go on into industry and accept the responsibility of keeping our country in the forefront in production and technological know-how which will keep us militarily and economically strong.

We are sure that the industrial-education teacher is dedicated to this task. ★

Combination Rotary Machine



Double Seaming Machine

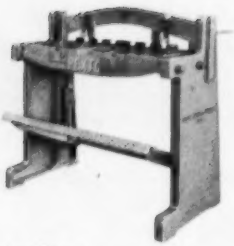


Furnace Collar Edging Machine

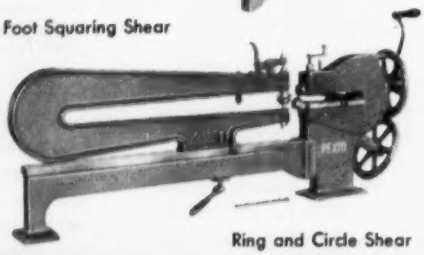
Scratch Awl

Setting Hammer

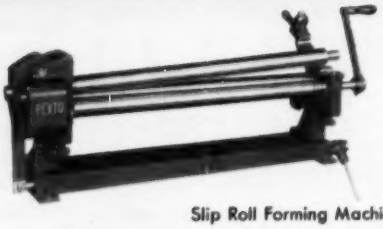
Straight Blade Snip



Foot Squaring Shear



Ring and Circle Shear

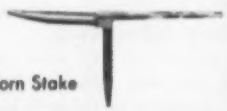


Slip Roll Forming Machine

Combination Brake and Folder

Adjustable Bar Folder

Hollow Mandrel Stake



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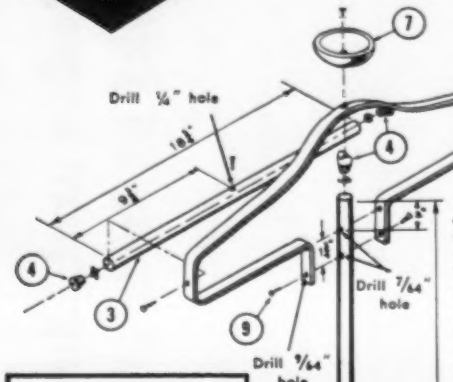


EXPLODED VIEW

FIGURE A

Assembly view of Silent Clothes Valet and versatile uses.

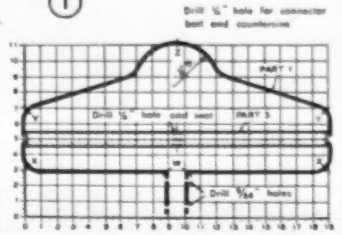


FIGURE B

Take a piece of brown wrapping paper or any other kind of paper and layout one inch squares as shown above. Then draw a line inside the squares duplicating the hanger. This line represents the inside measurement of the hanger.

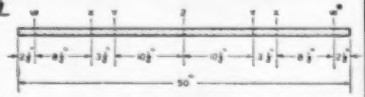


FIGURE C

Take the 6'-0" length ⅛" x ¾" aluminum bar and mark off 50" and cut to this measurement. Then mark off dimensions shown above.

LIST OF MATERIALS

- One 6' length ⅛" x ¾" aluminum bar
- One 6' length 1" aluminum tubing
- Three 1" T-butt connectors
- One 1" wall & floor flange
- One package No. 6x½" aluminum self-tapping screws
- Four ¾" flathead or oval-head wood screws
- One 12" disk (or square, or rectangle) of ¾" plywood
- One small metal ash tray

FIG. D

To form collar of coat hanger: Fill a 4" diameter can with sand and bend ¾" x ⅛" bar to form arc at the center of the bar.

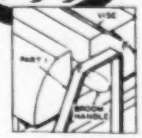


FIG. E

Place a broom handle in a vise and bend form arcs on marks "x" and "y" as shown in Figure B.

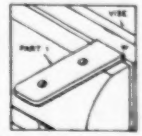


FIG. F

Place ends of hanger in a vise, bend and hammer to form a 90° angle. Round off corners on ends.

FABRICATION INSTRUCTIONS

Part 1–**Coat Hanger**–Made from 6'-0" length ⅛" x ¾" bar, cut to 50" in length. From figure C layout dimensions and mark points "w," "x," "y," and "z" for operation clarity. Place mark "z" over centerline of a 4" round object such as a 4" diameter fruit juice can filled with sand and shape over can as shown in Figure D. Using Figure B as a guide this operation forms the collar, now bend ends out to form shoulder section. To form bends on each end of collar section, shape the end of the shoulder section around a broom handle clasped in a vise shown in Figure E. This operation should be on marks "x" and "y." At mark "w" on each end, bend the ends to form 90° angles, as shown in Figure F by hammering them in a vise. Drill two 9/64" holes for No. 6 x ½" self-tapping screws in each 2½" end section of the frame. Drill two ⅛" holes for connector bolt and countersink as shown in Figure B. One required.

Part 2–**Trunk**–Made from 6'-0" length 1" tubing. Cut to 36" length, file or pare ends smooth. Drill four 7/64" holes to match 9/64" holes in part 1 for No. 6 x ½" self-tapping screws. One required.

Part 3–**Trouser Hanger**–Made from the remaining 1" aluminum tubing. Hold the coat hanger (part 1) in position on part 2 and measure the inside width as shown in Figure B. Cut the tubing ¼" shorter than the inside measurement. Drill a ¼" hole through the center as shown in exploded view and seat oval head as shown in Figure G. One required.

Part 4–**Connector**–Made from 1" Reynolds aluminum T-butt connector. Remove the screw and spring clip from 2 T-butt connectors and saw off the concave part with a hacksaw and file smooth as shown in Figure H. One required with concave part and two required without.

Part 5–**1" Wall and Floor Flange**–One required.

Part 6–**Base**–Made of ¾" thick plywood in a 12" circle (can be rectangular or square), however, a base 11½" thick will give a more professional looking job. One required.

Part 7–**Cuff Link Holder**–Use a small metal ash tray in any shape. One required.

Part 8–¾" flat-head or oval-head wood screws–to be used with parts 5 and 6. Four required.

Part 9–No. 6 x ½" aluminum self-tapping screws to be used with parts 1 and 2. Four required.

ASSEMBLY INSTRUCTIONS

Remove screw from 1" T-butt connector (with concave part), part 4, and place screw in ¼" hole of crossbar part 3, and place concave end of part 4 next to part 3. Attach spring clip loosely to screw. Insert bottom part of part 4 to inside of part 2 and tighten screw so that spring clip of T-butt connector will lock in place. Place part 5 on the other end of part 2 in like manner as part 4. On the two ends of part 3 insert T-butt connector (without concave part) part 4 to part 1 as shown in Figure J. Attach ends of part 1 to part 2 with No. 6 x ½" aluminum self-tapping screws (part 9). Attach base (part 6) to part 5 with ¾" flat-head or oval-head screws. Varnish or paint base before attaching. Mount cuff link holder (part 7) to top of coat hanger (part 1) by drilling a hole in the holder and attaching with No. 6 x ½" aluminum self-tapping screws.

Now hang up your coat, sit back, and relax in front of your Silent Valet and bask in the knowledge that "you did it yourself."

FIG. G

Lay part 3 on flat surface, protect head of bolt with wood scrap, and tap with hammer to form seat for bolt head.

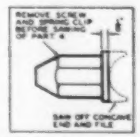


FIG. H

Take a 1" T-butt connector and saw off the concave part with a hacksaw and file smooth.

FIG. J

Place screw of altered part 4 through parts 1 and 4, attach spring clip loosely, and insert into part 3.

A rapidly expanding field is ready to help the schools

The Radio and Electronics Industry Looks at Industrial Education

By A. Coumont

Service Coordinator, Radio-Electronics-Television Manufacturers Association

Washington, D.C.

IT is rather difficult to conceive of any industrial-arts training which does not include electronics. Electronics today is a significant factor in the entertainment, educational, commercial, and military fields. Radio, the forerunner of electronics in the home, has now been aided and abetted by television. Many now consider both rather commonplace and no longer luxuries but part of our way of life. The rapid advances being made today by the electronic industries in translating products of the research laboratories into commercial products carries a promise of increasing application of electronic circuitry, not only for industry but within the home as well.

It seems natural that the products which play such an integral part of today's living, working, and learning experiences should be better understood by everyone. The understanding should surpass the identification of a commonplace electronic product by its outward features of control knobs and tubes. Rather, it should involve an understanding of the many other comparatively unknown electronic products, their uses, their place in our economy, and a knowledge of the industry that is responsible for their development, design, production, and distribution. Like Alice in Wonderland, the vista behind the picture tube presents a wide panorama of interesting activity, generally unknown, unappreciated.

Electronics, unfortunately, has set up its own barrier to those who are interested in seeking out some of the basic fundamental explanations of what it is and how it works. To the uninitiated, electronic products appear difficult to understand because they generally operate silently and without apparent mechanical movement; they have a variety of operating controls and their component parts are mysterious because they often cannot be seen.

The Mystery of the Black Box

The first objective of the teacher is to remove the mystery of the "Black Boxes" and to expose them for what they are — an assembly of parts which are better known and understood in the electrical, mechanical, metal, or ceramic field.

But to merely expose the hidden trick is not enough.

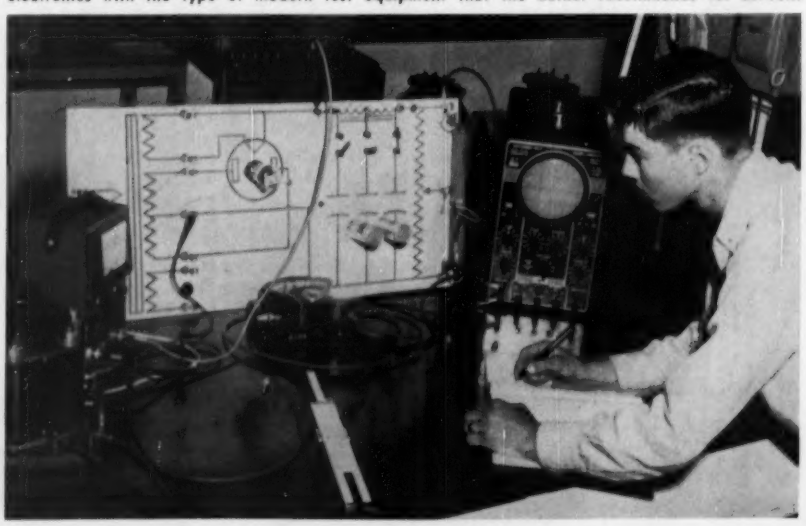
Electronics is not a subject that can be understood through lectures and demonstrations alone. It requires a more intimate relationship between the student and the product. Unlike a piece of rotating machinery in which the cause and effects can be understood by observation of moving parts, electronic products work through unseen forces. To capture the student's interest and understanding, these unseen forces and intangibles must be made real through analogies or at least with a visible method of measurement. Meters, oscilloscopes, and other indicating devices should be used to prove that something exists that otherwise cannot be seen.

The student should be personally involved in operating and testing a product or component. Fortunately, there are many simple experiments that can be set up in which the student can participate.

Because the purpose of teaching electronics at the industrial-arts level is to fascinate the student with the wonders of electronics and to develop his interest in seeking more information either in or out of class, the initial experiments should be complete in themselves and give the student the satisfaction of understanding the operation of a complete but simple electronic system. The following are a few suggested items that can be constructed easily by the instructor or students and used by the students to learn a specific application of electronics: (1) microphone — battery—earphone or speaker system; (2) audio amplifier; (3) regenerative receiver; (4) photo-electric cell with relay; and (5) relaxation oscillator.

Once the student realizes that the simple circuits he has operated or built are the foundation of more complicated electronic circuits or operations, he has less fear of being able to understand the broad fundamentals of electronics

Student at the Ranken School of Mechanical Trades, St. Louis, Mo., performing an experiment in electronics with the type of modern test equipment that the author recommends for schools.



and will in fact, be eager to pursue the subject further.

By and large, everyone, young and old, is interested in electronics. Given an opportunity to unmask the mystery that surrounds the basic circuits, the feeling of being able to learn more, acts as an incentive to obtain a better general understanding and develop specific skills. The nature of electronics either as an experiment conducted in the classroom or as a hobby to be pursued at home is practical and economical. A great deal can be taught or learned with the aid of a few parts either purchased or removed from discarded radio receivers. In many cases, the continuation of a simple operating circuit to one of more complicated behavior involves only a few low-cost parts.

Vocational students learning trouble-shooting techniques in the radio and electronics shop at the Eugene, Ore., Vocational School. Occupational opportunities are practically unlimited.

Problems for Teachers

Interesting students in electronics through elementary experiments associated with working models often results in a chain reaction. Teachers must be prepared for this. Curiosity, coupled with the satisfaction of successfully mastering elementary experiments, is a combination that will drive the young student to learn more about electronics. Teachers, therefore, will need to be prepared to understand a considerable amount about electronics in anticipation of the need to contribute to the selfdevelopment of their students. Thus unlike electricity or physics which in many cases are limited to the scope of lecture-demonstrations, electronics will present a problem to industrial-arts teachers who are not prepared to upgrade themselves beyond their lecture demonstrations.

Here we find that many teachers are not prepared. State teacher colleges are somewhat remiss in not providing adequate training related to one of the leading industries and one which will increasingly influence the activities and occupations of today's youth. Teachers handicapped by the lack of training in electronics have the natural fear and reluctance to become involved in an unknown area. Good knowledge of the subject is needed if a teacher is to lecture simply but effectively, and to stimulate motivation on the part of his students. Teachers cannot continue to depend on what they taught several years ago. Fundamentals have not changed, but new applications of these have created new products that represent electronics to today's students. There will be different products tomorrow. To keep abreast of the electronic industry and its products, teachers should seek the counsel of local industry people and make it a habit regularly to glance through trade publications to learn what is current in the industry.

The amount of time allotted in the classroom to electronics in competition with other subjects taught in industrial arts is not enough to adequately serve the interest of the student or the industry, which is eager to have itself and its products understood. Instructors should encourage their students to continue activities in electronics outside of the classroom. Such activities could involve the organization of a radio group to help promote participation in amateur radio activities. The operation of an amateur radio station requires licensing by the Federal Communications Commission. To obtain such a license, the licensee is required to have a basic knowledge of the principles of electronic theory and practice. The attraction of amateur radio as a hobby can be the driving influence to many in obtaining the knowledge and experience to pass their license examination. The thousands of men and women of all ages who today are actively engaged in amateur radio is a good example of the practical stimulation electronics can provide as a hobby.

High-fidelity audio reproduction is a comparatively new term and applies to a fast-growing area of the electronic industry. The fact that music, melodies, and rhythm are part of all of us, provides a natural latent interest. Students can be interested in assembling their own audio components to construct a simple sound-reproducing system. Kits in various degrees of assembly are commercially available, which can be assembled for a complete audio system. Any such home-assembled or -constructed sound system will bring the student in contact with electronic products and, most important, in a manner that will urge him to learn more about the component units in order to achieve greater satisfaction with the end result.

Try Field Trips

Since many electronic products are not adaptable to classroom study and examination, field trips to radio and television broadcast studios and transmitter sites will help broaden the appreciation of electronics. Students will appreciate the size, appearance, and nature of the transmitting equipment. Furthermore, it will enhance the understanding of the multitude of technical skills involved in transmitting radio and television programs for entertainment. Similarly, when possible, students should be given an understanding of electronics in communications from the small walkie-talkie to the large transcontinental transmitting and receiving networks. If it is possible to visit a local manufacturing plant where electronics products are assembled, a trip of this nature will do much to help the student understand the techniques of assembling a complicated piece of electronic equipment. In addition, it will broaden the understanding of the multitude of skills and

machinery involved in design, testing, and production.

To supplant visits to local electronic plants or in addition to such visits, it is recommended that the student body be given lectures, movies, or equipment demonstrations by members of the electronic industry. Such programs can demonstrate one or several practical applications of a category of electronic products. If possible, have the students participate in the operation of the equipment. Some examples of these are: closed-circuit TV; communication products; electronic controls; and computers.

Vocational Opportunities

When the student has determined that his career is in electronics, and of the type of terminal training offered by a trade school, he has before him a wealth of opportunity as a trained electronic technician. Trade- or vocational-school training should give the technician a basic fundamental education that will satisfy the preemployment requirements in all fields of electronics.

The average trade- or vocational-school graduate has no difficulty today in finding employment in the electronics industry. But this should not be taken to mean that the present training programs are adequate. Rather, industry has such an urgent need for technically trained manpower that it is doing the best it can with what is available. Actually in many cases the industry has been forced to institute training programs that should have been given to students during their schooling.

In general, many of today's technicians were not trained adequately to take their place in an industry noted for its rapid technological changes. Many technicians cannot appreciate the behavior of advanced circuitry because they were not given a sound knowledge of the principle of its component parts. There is a need for a general reappraisal of the training now being given in trade and vocational schools so that it can better meet the needs of the industry. RETMA has undertaken a program of this nature which has resulted in the development of special course material recommended by the industry.

Today, an electronic technician must have a background in electronic theory and basic laboratory work which will give him the ability to perform tasks above the routine level of repair. The technician should be given training that will prepare him to apply his knowledge to complex circuits and testing procedures. The electronic technician is not solely trained for the field of radio or television set repair. Rather, his fields of employment also include the commercial, industrial, and military uses of electronic products.

A number of excellent textbooks dealing with electronic theory are available that will satisfy the need of instructors in conducting their lecture and demonstration classes. However, there appear to be shortcomings in the type of laboratory programs that are pursued. On the average, there is usually little if any correlation between what the student is given in the lecture room and his laboratory work. In some cases the lab work consists of constructing a variety of radio amplifiers and other devices. This is followed by a series of electrical measurements and trouble-shooting on student-constructed radios. Valuable time is consumed in a "building" program which otherwise can be used to perform basic experiments designed to illustrate electrical or electronic principles. Laboratory time should be used to develop skills which are directly related to the student's employment potential.

Another serious limitation existing in many school laboratories is the lack of proper equipment for the students' use. Obsolete instruments, no longer used in the industry, are frequently found in school laboratories where there is not enough of the correct type of instruments to allow them to be freely used and fully understood by the students. The proper use of instruments is one of the basic skills that students must master to become an efficient technician.

Many courses are based on the same curriculum used year after year. No thought has been given to upgrading the course to match strides and changes of the industry. As a result, students spend time on irrelevant material to the exclusion of necessary training.

Course Material

To fill a part of the need in preparing students in trade and vocational schools for electronic technician careers RETMA, on behalf of the electronics industry, has developed preemployment course material which will help overcome the limitations previously mentioned. In addition, it can serve to standardize this type of instruction so that the nation's schools can more effectively serve the industry by following a prescribed formula. RETMA's prescription consists of an Instructors' Guide and laboratory manuals for basic electricity, electronics, radio, and television. The laboratory manual contains all the recommended jobs that the student should do. Lab jobs or experiments covering fundamental skills in this field are completely prepared and include (1) objective; (2) materials required; (3) introductory information; (4) detailed procedure; and (5) questions (based on the job).

Laboratory assignments are geared to keep pace with the student's classroom work, and the student actually completes lab jobs that have been recommended for discussion in the class. Both the class and lab work give the student a complete understanding of radio, electronics, and TV principles while constantly relating these principles to the current products, practices, and techniques used in the industry.

It is recommended that the course be divided into "theory" and "practice" with approximately equal time given to both. "Theory" should include both electronic principles and their application to radio and TV receivers. Servicing problems and techniques should be highlighted in the classroom and practiced in the lab. Circuit theory should be qualitative in nature, although a minimum of simple mathematics will be required which can either be integrated into the course material or given separately as related math.

A course outline has been detailed to include the most recent advances in the art. A consistent, unified extended approach, has been planned — teachers will not have to reteach old concepts to show application to newly discovered radio phenomena. Rather, the basis for the new phenomena will be set forth as soon as the concept is introduced.

The units of instruction will lend themselves either to a concentrated program that might be given to high-school graduates whose full time will be spent studying radio and TV, or to a conventional vocational-school program where these units could be scheduled on a period and term basis.

The laboratory program will be complete in every detail and will serve as the mainstay for a successful pre-employment course. Students will be taught both the diagnostic skills, the use of test instruments, and the practical skills they will need to service and maintain radio and TV receivers. The use of test instruments will be taught as early as possible. Thus, the student will make measurements with the VOM during the second day of classes. He will use the oscilloscope very early in his training. The student must develop an understanding and respect for the use of the tools of the trade as soon as possible.

It is recommended that a breadboard trainer be used during the first 400

(*Continued on page 66*)

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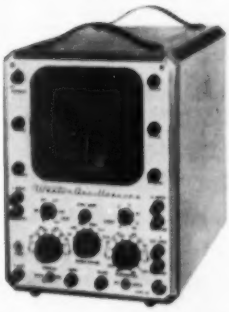

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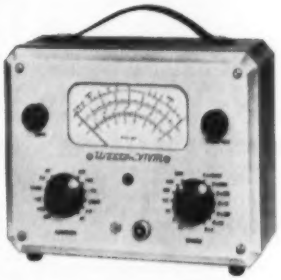

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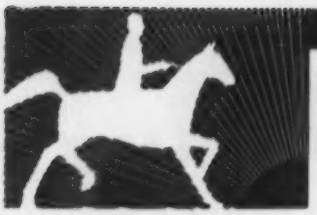

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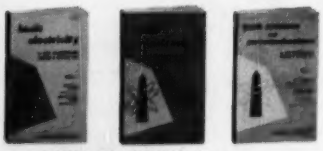

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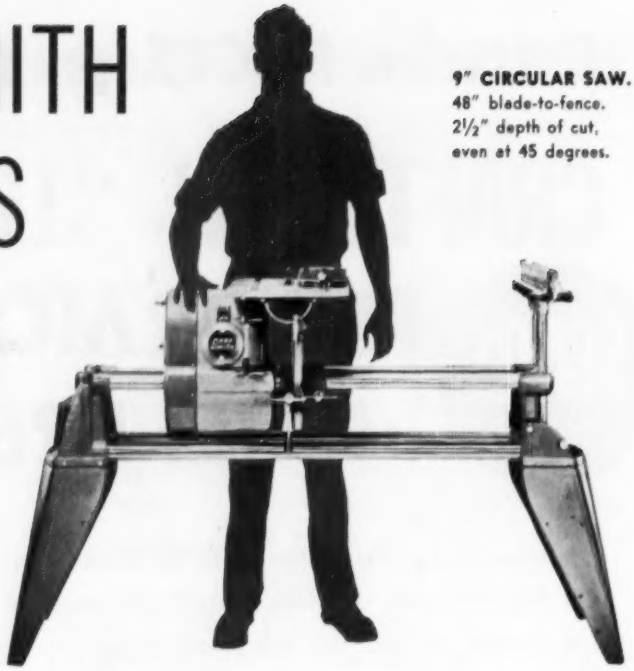

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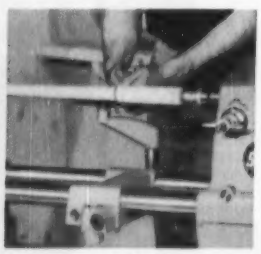

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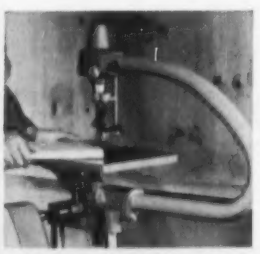

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Apprenticeship still plays a major role when

The Construction Industry Looks at Industrial Education

By Welton A. Snow

Secretary, Apprentice Committee, Associated General Contractors of America, Inc., Washington, D.C.

THERE is an ever-increasing need for skilled workers in the construction industry. Despite the fact that the industry each year trains more skilled craftsmen than any other single industry, there is currently a shortage of both journeymen and the apprentices who will take their places in the next few years.

This constant need for more apprentices and journeymen results from the record-breaking growth of the construction industry during the last decade. The construction industry in post-war America has grown until it now stands as the largest single production activity in the nation.

For ten consecutive years, total expenditures for construction have steadily increased, setting new records each year. In 1955, the industry set an all-time high for construction dollar volume with spending for new construction alone totaling over $42 billion. Maintenance and repair work amounted to another $15 billion. This $57 billion total last year means that about one dollar out of every seven that was spent for goods and services went for construction.

Last year there were about 4,750,000 workers directly employed in construction, and an additional 5,000,000 who worked to service the industry through manufacturing, transportation, and distribution. Together, these two groups represented over 15 percent of all gainfully employed persons in the nation.

This year more hundreds of thousands of construction workers will be needed as the total volume of construction is expected to reach $60 billion.

Presently, there are close to 100,000 registered apprentices preparing to fill the ranks as qualified craftsmen in order to keep pace with the huge demands of the industry. It has been estimated an additional 50,000 to 60,000 young men, for whom the government has no records, also are apprenticed in the construction trades.

Regardless of their particular field of construction work, all of these young men are trained by one method—apprenticeship.

Although methods of training apprentices have changed greatly through the years in order to keep pace with new construction techniques, apprenticeship is basically the same. No plan has yet been developed to substitute for this time-tested method. It is only through such training that the apprentice can apply manipulative training, and at the same time observe and undertake the many complexities that are common to construction projects.

Unlike apprentice training of the past, the apprentice's related training in his particular craft is usually conducted in a classroom one or two evenings a week.

In this manner the apprentice can learn trade mathematics, estimating, how to read plans, common elementary design, and many other phases of his chosen trade.

Today, the apprentice is a working student who has been sponsored in his work by a local joint committee of equal representatives of both employer and labor representatives. He is guided by the program set up by the joint committee.

The subjects and training that a boy receives prior to becoming an apprentice in one of the construction trades are extremely important. If the young apprentice can prove through demonstrated ability that his skill and knowledge of a trade are above average, he may advance more rapidly, thereby

A typical local joint-apprenticeship committee, made up of an equal number of representatives from management and labor, interview an eager candidate and approve him. Part of his training is spent in the classroom, one or two evenings a week, and part while on the job.

Related training provided by the public schools in a regular classroom with a qualified and experienced instructor supplements the apprentice's practical work. After completing satisfactorily his on-the-job training and related instruction, he happily receives a "certificate of completion."

shortening his original term of training.

This advancement of apprentices is important to the construction industry. Such a method releases another qualified craftsman to a market which needs more skilled tradesmen to bring about the tremendous volume of construction necessary each year to help achieve this nation's rapid expansion.

That is why the construction industry feels a vital concern in the quality and type of "construction education" that a young apprentice receives prior to his becoming indentured in one of the many apprenticeable trades in construction.

However, the changing economic concepts and industrial evolution that have developed in recent years have tended toward an era of specialization. Any "help wanted" column in the daily newspaper will list the varied and technical occupations to be filled by men and women who qualify under very definite and rigid specifications. So it would seem that industry in general is looking more for technicians and specialists who are skilled in one particular phase of the vast and complex manufacturing, processing, or service fields.

Although some steps toward specialization have been successful in the construction industry, this type of operation is primarily confined to multiple housing developments where many or all of the houses at the project are of a single basic design.

In this procedure, after the work routine is established, it is possible that one carpenter might saw lumber all day, another might pre-assemble the pieces, while still another might fit them into place. However, this type of construction is the exception rather than the rule.

Industrial and commercial construction projects are prime examples of the type of structures which demand fully trained and qualified craftsmen in every phase of work. By the application of their collective and diversified skills a structure emerges from a hole in the ground to a steel skeleton and finally the finished building. Taking part in such a project would be dozens of journeymen and apprentice carpenters, bricklayers, iron workers, cement masons, and operating engineers.

Probably the most important goal in training an apprentice in construction trades is the development of a "well rounded" craftsman in his particular field.

In carpentry, for example, this would mean a craftsman who could build and place concrete forms, cut and place rough framing, lay out and apply outside and inside trim, and generally install any form of wooden structure that is used in erecting a building.

The carpenter must coordinate his work with the other phases of the project so that he is not ahead or behind the cement mason, the electrician, plumber, or other such workers.

Also, he must be able to read and understand building plans, compute areas and volumes, and have a general knowledge of trade mathematics.

His formal school training must reflect these requisites. He should have a knowledge of trade mathematics, basic geometry, trigonometry, elementary design, and shop practice. Besides training in the care and use of his tools, a carpenter will find knowledge of woods and their use and characteristics invaluable.

However, figures will show that most carpenters, after they have completed their apprenticeship, will not be employed as millwrights or cabinet makers. Usually journeymen carpenters seek careers in the broader field of general construction. Carpenter apprentice-training curriculums should be broadened accordingly.

It is desirable for the carpenter to know and understand the purpose of dovetail joints, mortises, and tenons, but the chances of the carpenter applying this knowledge in construction are limited. Precision work, such as this, is primarily associated with cabinet or furniture production and is usually done at the factory with the finished product delivered and ready to install.

In training carpenter apprentices more stress should be placed on the common structural phases of construction which are found in many homes and buildings. Types of framing, their advantages and disadvantages; double studding and lintels, their use and need; and the application and reasons for cross bracing and sheathing are just a few of many operations that are considered common practice to the construction industry's carpenter. These, as well as other practical points in the trade, would add materially to the pre-apprentice training of a young man about to enter this field.

The opportunities for today's apprentices in building construction are unlimited. The nation's economy is expanding and the population is rising at an accelerated rate with it.

All of this means that construction activities will continue at a sharp upward trend at least for the next decade. Construction is an important field of work and it is today's apprentice who will play a vital role in shaping America's economic growth of tomorrow. ★

Some suggestions on what to do are offered as

One Woodworking Industry Looks at Industrial Education

By Harry J. Kelley

Manager Industrial Relations, American Seating Company, Grand Rapids, Michigan

THE woodworking field and industry's views on its industrial-education aspects is a challenging but broad area of discussion. Our experiences have been confined to a single industry and to a single company within that industry. The following observations are offered subject to this limitation.

The American Seating Company is in the public seating field—the largest such firm in this industry—and, for more than 70 years, has worked with woods of many types. Currently, the greatest volume of the wood we use goes into church pewing and furniture. A considerable amount of this is in the general field of cabinetmaking. Lecterns, pulpits, altars, baptismal fonts, and similar products involve the cabinetmaking skills and techniques.

We can say that from our point of view, and we believe it would be substantiated by others in the woodworking field, that one of the real needs is for more young men who are interested in this field as a trade. Few indeed are the skilled workmen when compared with the over-all need. One of the reasons for this may well be the current-day emphasis on change. The result of this is, all too often, a reluctance on the part of youth to take the time to train thoroughly for the higher skills. This condition is not limited to the woodworking field, but is quite general throughout industry. The consequence is that apprenticeships go unfilled and men, often not fully trained, have to be used on work for which they are not fully qualified.

Manpower Needed

It seems to us that our educational system, and particularly the industrial-arts and vocational-education group, have an opportunity here to make an outstanding contribution to the economic scene through an intensified program that encourages more youth to seek careers in the skilled trades areas. In suggesting this, I do not mean to imply that this group is not now making a significant contribution. What I am saying is that even more effort is needed.

The cause for the fewer relative number looking to the skills for a career does not lie just at the doorstep of education. Rather, a considerable degree of this responsibility rests with industry. I say this in the sense that changes in our industrial procedures have made the mass-production jobs highly attractive to young persons just finishing high school. The assembly lines bring promise of high pay quickly and this is a most compelling argument to many youth. The woodworking trades are still—many because of their very nature—craft types that cannot or, let us say, have not as yet, become routinized. It takes time to learn a woodworking trade and to the young man of today this delay in top earnings often outweighs the other advantages.

There are advantages in the trades. The furniture industry, which has become so universally associated with the name of Grand Rapids, has need for many in the general category of cabinetmakers. Essentially, the call is for men who know woods, their uses, and how to work and fit and finish them. The old-time cabinetmaker looked on his finished product with glowing pride. He had an affection for his product—there was something personal about it.

Old and young work together, studying the blueprints and specifications for church pewing. There is a much greater need for skilled workmen than there are young men training for it.

What to Do

At this point we would suggest that both industry and industrial educators take time out to check their situation to see where they stand and in which direction they are headed. It seems to us that this evaluation could well take into consideration some of the following points:

1. *Give thought to the need for greater liaison between the school and the employer.* The common denominator is the individual who is the student of today and becomes the employe of tomorrow.

Such liaison could be initiated by industry as an evidence of interest in and support of the educational system. Take the woodworking field, for example. Industry in this area of activity could well furnish blueprints of actual products for the cabinetmaking courses; they could encourage plant visits where the students would see the materials, machines, and men in use and at work; they could provide factual discussion material that would present to the young man who is teetering on the verge of a decision sufficient spark to turn his life to woodworking.

On the side of education, this liaison could consist of the school taking advantage of some of the points just mentioned. In addition, we think it would be helpful to their educational work if at some time they had had woodworking experience in industry.

2. *Develop,* jointly perhaps, *film presentation for schoolroom use* that would bring to the student a clear picture of the role of furniture, not only in our homes and offices, but in the whole economic plan.

Such a film should be directed to the interests of youth and present the material in such an attractive manner as to encourage their desire to move into this field for a career. The story of furniture, of woodworking and its related parts, is filled with drama.

3. *Examine the whole teaching approach to industrial arts and vocational education to make sure that it relates to the realities of industrial life.* We do not suggest by this that such a relationship does not exist in many of our educational institutions. However, we feel there is need for a continuing examination of the subject to make sure the curriculum—its subject matter and methods—keep up with changing conditions.

The objectives of industrial arts as set forth in the publication by the American Vocational Association entitled *A Guide to Improving Instruction in Industrial Arts* (1953) are comprehensive and pertinent in our judgment. (See page 18.) The goals set forth, if carried out adequately in our educational institutions, would bring to the machine and bench in the factory a better employe. We recognize, of course, the problems of carrying out in practice what is set down on paper.

4. *Study the best methods of transition from the school workbench to the industrial workbench.* There appears to be a gap between the two. The closer liaison suggested above would solve some of this.

Possibly some of the gap is due to lack of understanding of what each is trying to do. Has industry properly informed the educator what he expects of the woodworking graduate? Has the educator given the employer an adequate picture of what the student has learned? And then there is the most important person of all—the individual student who, we might say, is right in the middle. Does he know what to expect when he leaves school and knocks on the employer's door? Has he been oversold or undersold?

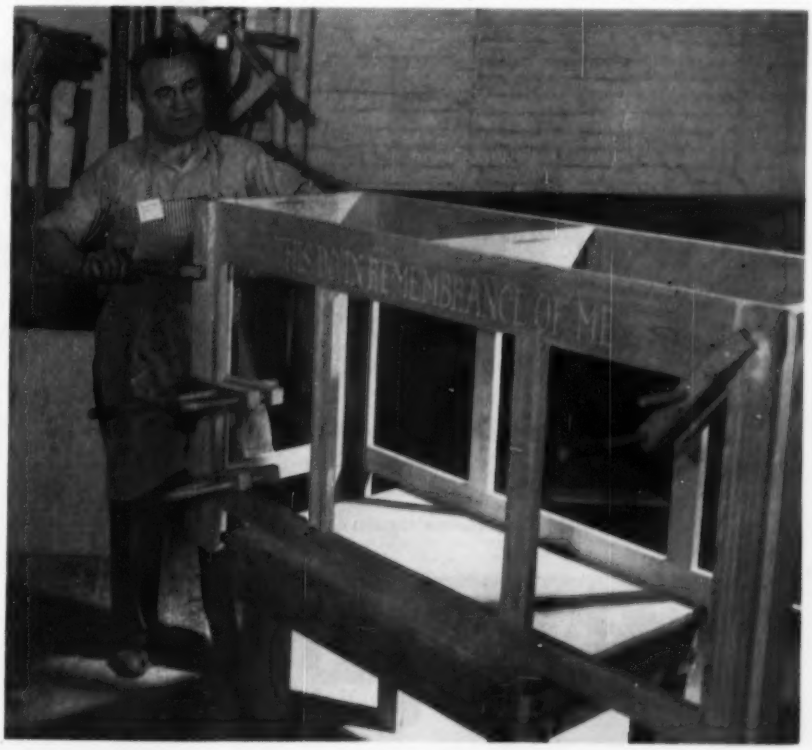
From the viewpoint of the employer, the young applicant who has a woodworking background in school is expected to have some knowledge and experience in the function and operation of the machines to be used. He should know the basic terminology of the trade. He should come out of school with the expectation that he will have to prove himself on the job, not that all he has to do is to punch in and out in order to get his pay.

The employer does not expect the young applicant to come to him as a skilled craftsman. The employer is looking for a potential craftsman. Here, I think, industry has some responsibility. Industry in the woodworking fields could well afford to develop facilities and personnel to build on the foundations of the schools and provide on-the-job training for the young employe. Such training does not consist of simply putting him out on the job with the advice "Pick up what you can," and then leaving him. Unfortunately, this happens all too often. Happily, on the other hand, more and more are recognizing the importance of properly training the new man so that he does become a skilled woodworker.

Our experience in our own community — Grand Rapids — with our schools has been excellent. They have shown both an interest in and an understanding of the needs of industry. We have worked together in the industrial-arts and vocational-education program —sharing our backgrounds and knowledge. This has been possible because of the attitude and outlook of both the industrial and educational leaders.

We think that the type of cooperation and understanding being carried on in our community can well be emulated in other areas. The results of such a cooperative approach can bring immeasurable benefits to everyone concerned—the schools, industry, and, above all, to the student-employe. ★

Skilled hands and pride of workmanship characterize the experienced cabinetmaker. Schools and industry should give more thought to means of greater liaison between work and school.



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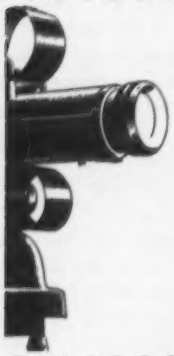

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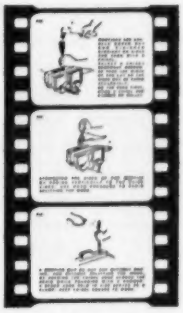

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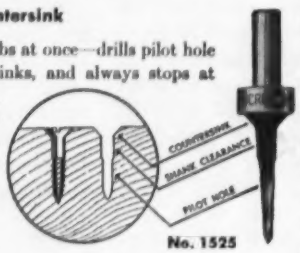

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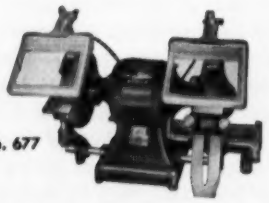

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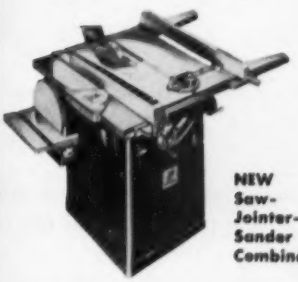

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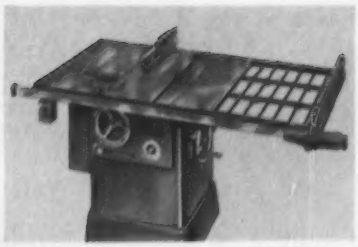
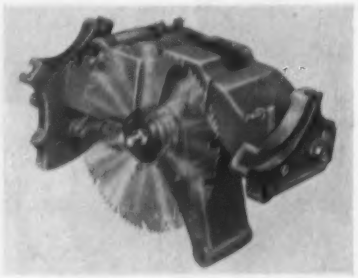


3 TABLE SIZES — 35" x 27½", 43½" x 27½", 54¾" x 27½", with 12½" of working surface ahead of blade when blade is set for 3⅛" depth of cut.



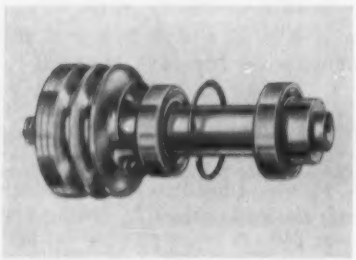
MASSIVE CRADLE, ARM — Heavy box-shape castings for maximum strength. Inside and out, the Clausing is ruggedly built.

SO FAR AHEAD IN QUALITY
MUST SEE IT TO BELIEVE

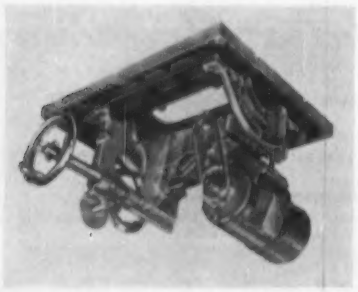
The picture gives you an idea of its massive, business-like appearance. You can see the heavy cast iron base, rugged steel housing, the big control wheels and large precision working area. It looks like a saw built for years of heavy-duty use. And it is.

- ★ It's heavier throughout . . . constructed to handle power up to 3 HP! Saw alone weighs 385 lbs!
- ★ Has bigger arbor-bearing construction — ¾"diameter. Sealed-for-life, preloaded ball bearings.
- ★ Exclusive new totally-enclosed, fan-cooled, continuous-duty motors — result of 3 years of saw-motor research. 1, 1½, 2 and 3 HP.
- ★ New modified-wedge cogged belts for most efficient transmission of power.
- ★ Self-contained design. For safety and compactness, motor and drive are housed in base.

New CLAUSING 10" SAW



BIG ARBOR, BEARINGS — Arbor is solid bar of precision ground steel, ¾" in diameter. Spins on two large, sealed-for-life ball bearings . . . kept under preload by beveled retaining ring.



MOST EFFICIENT TILT and HEIGHT CONTROL — In both mechanisms, rack teeth are machine cut cast iron, ¾" wide . . . worms are 1½" diameter steel. 8" diameter handwheels. 4½" diameter tilt dial.

And these features of the new Clausing make it more efficient, easier to use:

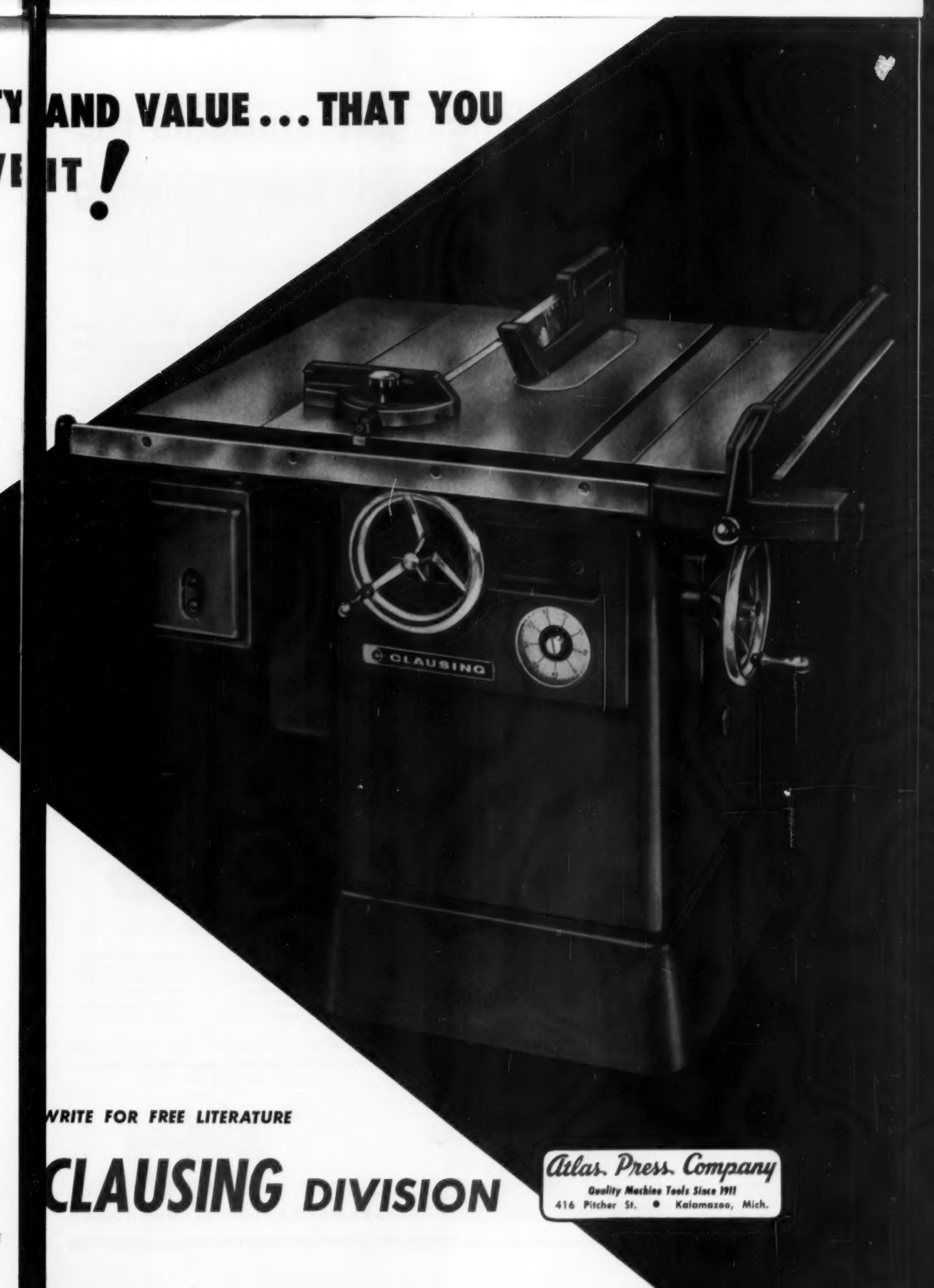
- ★ Double-locking, lift-off fence. Slides where you want it. Locks or releases for lifting off, instantly.
- ★ Bigger cast aluminum mitre gauge, with 8¾" x 2" face.
- ★ More efficient blade control. 8" diameter cast aluminum hand wheels position blade with almost effortless action thru worm and rack mechanism.
- ★ New tilt dial. Easier to read. Permits settings accurate to seconds of a degree!
- ★ Clear-vision guard. Work and blade are always visible.
- ★ Easy-to-align splitter. Has cast iron mounting bracket.
- ★ Insert plate is easy to level from top.
- ★ Big, removable clean-out panel.

And there are many more construction and performance features that you'll appreciate. Send for complete information TODAY.

Atlas CLAUSING — PRECISION MACHINE TOOLS — ATLAS PRESS COMPANY

THE PLUS VALUE LINE

TY AND VALUE ... THAT YOU VE IT!



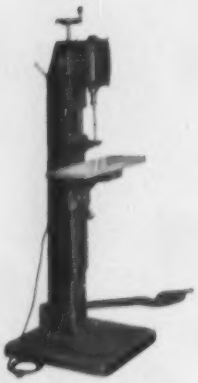
WRITE FOR FREE LITERATURE

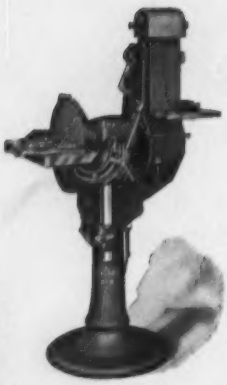
CLAUSING DIVISION

Atlas Press Company
Quality Machine Tools Since 1911
416 Pitcher St. • Kalamazoo, Mich.

OLIVER machines give students the most thorough basic training

Used in the nation's leading vocational shops



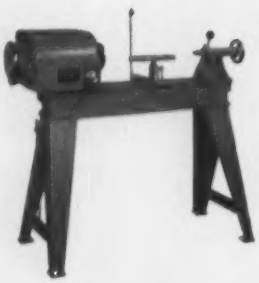


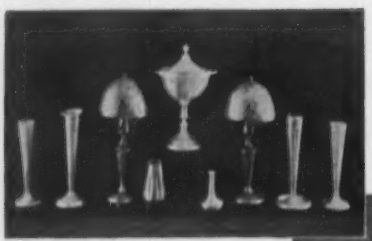
Your Oliver-trained student has a decided advantage. His training on factory-proven machines is a sound basis for progress in industry.

The ability to endure rugged service year after year characterizes Oliver machines. They are designed and built for industry by engineers who also know the needs for thorough student training. Furthermore, Oliver safety features are the latest.

Students find Oliver machines easy to set up and operate. Self-locking devices keep the machines in perfect adjustment. In over 2345 vocational shops instructors agree that Oliver machines give more and better service for the dollar.

The machines shown here are but a few of a complete line to make your teaching efforts most effective.





METAL SPINNING LATHE
— helpful and valuable in any shop!

Spin beautiful, useful vases, cups, trays, etc., from copper, bronze, aluminum and other metals. The Oliver No. 159M Metal Spinning Lathe is precision built with extra heavy bearings for rugged service. Has ball bearing variable-speed motor-driven headstock and live tail center. Swings 12" diameter, 24" between centers. Can also be used for turning wood and light metals.

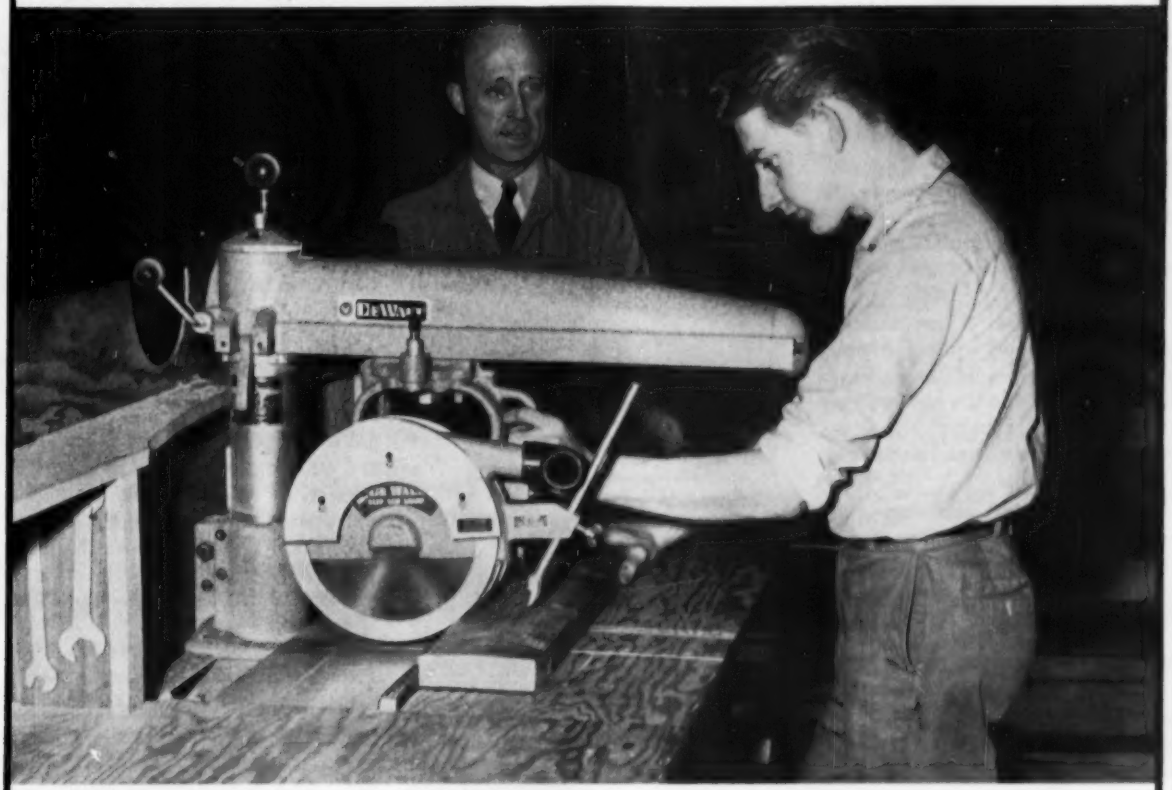
OLIVER EQUIPMENT FOR VOCATIONAL SHOPS

Borers	Mortisers	Circular Saw Benches
Sanders	Surfacers	Straitline Cut-Off Saws
Shapers	Wood Trimmers	Metal Spinning Lathes
Tenoner	Band Saws	Woodturning Lathes
Jointers	Band Saw Brazer	Oilstone Tool Grinders
Jig Saw	Knives and Saws	Benches and Vises

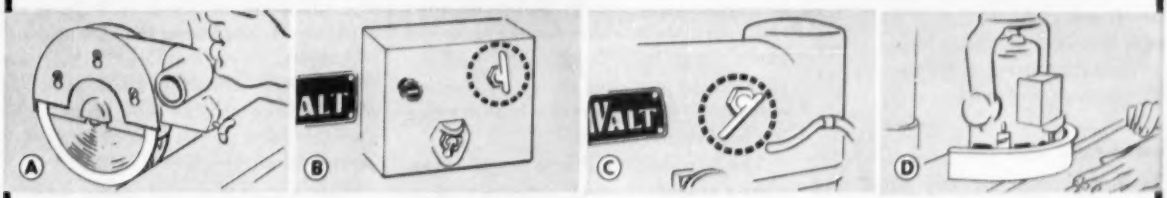
Over 2345 vocational shops use Oliver equipment. Tell us the machines that interest you, and we'll send you bulletins containing full details.

OLIVER MACHINERY CO.
GRAND RAPIDS 2, MICHIGAN

Future job safety is your responsibility...



And De Walt® has the safest record in industry!



You need these exclusive operating safety features: **A**—Simpler, safer top-side cutting with exclusive safety guard. See your mark *and* your saw. **B**—Power brake stops saw in 4 seconds for *added* safety. **C**—Safety key switch prevents unauthorized use. **D**—De Walt becomes tilting arbor shaper with exclusive shaper guard—gives 50% more shapes per cutter. Combines 12 basic power tools. Builds into workbench, gives safer straight-line handling.

Train your students on an AMF De Walt—preferred in both home and industry for accuracy, versatility—*plus the safest record of performance.* Arm raises, lowers, swings 360°. Motor and saw ride on arm, rotate 360°, tilt downward past 90°. Powerful direct-drive motor accommodates any circular tool, saves cost of separate machines. De Walt's the saw your students will later use!

2 popular sizes for schools...GW-I, 1½ hp, 10" size for industrial arts...GA-N, 3 hp, 12"-14" size for vocational training.

See your supplier or send for FREE BOOKLET.

Another AMF Product
DE WALT POWER TOOLS

De Walt Inc., Dept. SS-56-4, Lancaster, Pa., Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

☐ Please send me FREE BOOKLET on Job-Tested Safety Cutting Methods
☐ Please send information on De Walt 16mm sound classroom film

Name_____

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Address_____

City_____ Zone____ State_____

☐ *Students!* Check here for special literature

Graphic Arts ..... *from page 30*

spreading ideas, influencing public opinion, and giving the people a voice—a voice in their government, a voice in anything that concerns them. The printer's contribution to the growth of democracy was so fundamental that freedom of the press was one of the basic rights incorporated into the First Amendment to the Constitution of the United States.

Our great transportation and communications systems give our people the opportunity to move freely from place to place, finding their fortunes wherever there are fortunes to be found, even if that fortune be only the right and the opportunity to work. These priceless gifts would not be ours without printing. Printing helped to build the railroads and the highways and the airlanes over which we travel. Printing has struck away the chains that bound us in time, condition, and space.

Our high standard of living is dependent on printing. In America, because of our freedom, our resources, our education, our national income, and our tremendous production of consumer goods, we can buy things to add to our health, comfort, and culture. Through the printed word, we learn of the advantages of the several competitive products which catch our interest. The purchase of every single thing we use is aided by, related to, or connected with the printed word. Our food, clothes, and practically every item of consumption is advertised, labeled, and packaged through the work of the printing press. The printing industry contributes to our health, comfort, and safety.

Onward and Upward

The industry has recently noted that there will be 30,000 positions to be filled this year, and that the better ones will go begging for want of competent applicants. That seems to me a pretty convincing argument that the need for training and instruction will go on and on.

In its growth, the printing industry has far outdistanced nearly all other trades and professions. All branches of the industry are making tremendous investments in plants and equipment to serve American business better. The graphic-arts industry invested approximately $258 million in 1954 to give the finest service ever. This is a small part of its total expenditures which in 1954 probably exceeded a figure of $3 billion. Can anyone doubt that this is going to provide a fertile field for more training?

The printing industry is one of the mighty rocks in the foundation of America. Her power, might, and majesty come not only from her people, but also from her measureless resources, and her amazing production which is the envy of the world. Those resources can never be completely developed and utilized, nor that production maintained, unless the printing industry keeps pace with our national progress, marching in unison, but a step or so ahead. Those who are giving a new generation of printers the knowledge of the industry's traditions and heritage, its methods, its processes, and its techniques are performing a dedicated task. I know of no satisfaction that is greater than being able to look at a successful venture and say: "I helped to make it so." All of us have complete confidence in the future of printing, and that confidence comes from the sure conviction that the teaching of our craft is is in capable hands. ★

Drafting ..... *from page 12*

industry. In view of this fact, I feel that the best interests of the student will be served if teachers of drafting place more emphasis on the drawing techniques predominantly used in industry today.

New concepts are rarely received with complete equanimity. At first, long established patterns of procedure may appear to be an insurmountable obstacle to a wholehearted acceptance of such things as simplified drafting practices. The cost reductions that can accrue from any time-saving system will more than repay any organization for the time and effort spent in educating its drafting-engineering personnel in new approaches and solutions—a point of which drafting teachers should be aware.

The introduction of new practices presents a real problem. In industry the successful use of simplified drafting practices depends to a great extent on the understanding and cooperative effort of the persons actually making the drawings. Supervision may generate ideas, supervision may plan, but the man at the board, with pencil in hand, is the one who will put the savings into effect. Therefore, the job of supervision is to "sell" the value of the new methods and enlist the draftsman's cooperation to put them into effect. If optimum results are to be realized, the beginner must be properly trained. This is a real challenge to drafting teachers.

The first attempts to obtain effective application of simplified drafting practices were not as successful as had been anticipated. A teaching method has now been devised that is bearing results far beyond our expectations. This method, which has been eminently successful in industry, may have some implications for the classroom.

About three years ago the General Electric Company organized a formal teaching program employing this method, and although it was designed for use in industry, it should arouse the interest and enlist the cooperation of the drafting teachers in our schools.

The specific objective of the program is to develop in the draftsman the habit of looking objectively at the item he has to draw for every possible shortcut, without in any way sacrificing accuracy, clarity, completeness, or neatness.

The program is presented by instructors who go from department to department and present the story to small groups not exceeding a combined total of 50 engineering, manufacturing, and production people. Numerous visual aids and other props are used to engage the interest of the audience. Visual-cast slides are shown of portions of recent drawings, made by that particular group. The examples are selected to point out the employment of unnecessary detail and extra delineation.

Brainstorming Sessions

One means by which the value of simplification is impressed on the draftsman has come to be known as "brainstorming." In a brainstorming session a recent drawing, made by the group attending, is hung on the wall or on an easel and the class is asked to suggest improvements, employing the "brainstorm" technique, which temporarily rules out the "judicial" thinking. Ideas are called out spontaneously as they occur to the audience, and the lecturer records them on the drawing.

This suggests a plan under which a group of drafting teachers might examine the drawings made in their classes with a view to eliminating unnecessary lines, views, and elaborate details. By this means they would keep their instruction in line with industrial practice and conserve the time of their pupils, as well as make their assignments more interesting and challenging.

Countless testimonials could be cited from industrial firms, both large and small, concerning the effectiveness of simplified or functional drafting practices, such as those discussed in this article. I have tried to emphasize the idea that a draftsman, to be successful in industry must, at all times, be cost and value conscious in the consideration of his work. I have also pointed out some of the problems which graduates will encounter in industry when they begin

to make drawings "for good" instead of as textbook assignments. Simplified Drafting has become another important tool in work simplification, which is being increasingly used in industry today in order to meet the challenge to produce more and better goods with less effort. This suggests that teachers of drafting critically examine what they are teaching today and in planning future courses place more emphasis on teaching practices that are in harmony with the current practices in the industrial world. ★

Electrical ..... *from page 20*

will he be able to arrive at the necessary equipment sizes needed to do a job at an honest price? Lacking these fundamentals and trusting to guess-work he may ruin his own business or the customers' property or both.

So we feel good theory on problems involving sizes of services, conductors, protective equipment, resistance, voltage drop, motors and their characteristics, etc., are the foundation for practical work.

Practical work is very diversified. We naturally suppose that tools of the trade are always available. One thing is certain. Display boards illustrating approved wiring methods, wiring devices, protective equipment, etc., for purposes of identification are strongly recommended. These will depict the language of the industry to those desiring to enter the trade.

Of course, practical circuiting invariably begins with bell and buzzer circuits. This bench work is the beginning, but only the beginning. From there on we branch out into 120-240-880, etc. volt circuits commonly used in the construction industry. It is essential that all students become familiar with all wiring methods approved for use and their limitations such as knob and tube (open wires), cable assemblies, metallic sheathed cable, conduit (heavy wall), and electrical metallic tubing (thin wall), flexible conduit (Greenfield), and others as listed in the National Electrical Code.

If at all possible, we recommend erection of a practice wiring structure similar to the rough-in work of a group of rooms in a house. Permit the students to bare joists, pull wire, make necessary installations of boxes for lights, switches and outlets, using an assortment of materials. When the job is finished let the students "ring out" the circuits, test for grounds, shorts, etc. Furthermore, every trade student should be given instruction

Fibre-glass makes this new welder SHOCKPROOF! NOISELESS!

IDEAL FOR CLASSROOMS... SAFE—SILENT

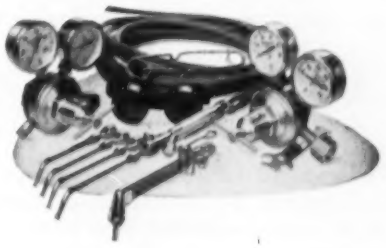
Marquette's new 90 Series Welder is best for classrooms because it is shockproof, noiseless and makes arc striking easier. Why? The welder is enclosed in tough, durable fibre-glass which is *non-conductive!* The "Perma-Shield" cabinet eliminates eddy current losses, noisy vibrations and shock-danger. This new welder is ten per cent more efficient and provides improved arc striking characteristics . . . advantages that teachers and students alike will welcome.

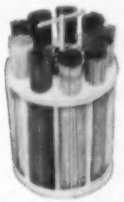
That's not all! The fibre-glass cabinet is rustproof, colorproof, waterproof and moisture proof. It's stronger than steel but lighter in weight and practically indestructible. The entire welder is best for training purposes because it's easier to operate (heat taps are clearly marked and safe, positive and easy to select), it's built to last longer and it will always keep its new appearance.

Two sizes in four models are available. One delivers a maximum of 200 amperes; the other, 275 amperes and each is available capacitor equipped, for increased power factor.

WHAT DOES ANODIZED ALUMINUM MEAN TO WELDING TORCHES?

It's new and Marquette's got it! Oxy-acetylene welding torches made of *anodized aluminum* make them 50 per cent stronger and 50 per cent lighter. Precision made, they're practically unbreakable and will stand years of rough handling. Makes them perfect for training schools. Eliminates factory service because they're equipped with fast change O-ring seals. Simply replace worn seals with new ones and the torch is ready for action in minutes time. Three models (Aero-Jet, Star-Jet and Super-Jet) are available for welding and cutting all thicknesses of metal.





WHAT KIND OF ROD DO YOU WANT?

Marquette makes a welding electrode or gas rod for every welding application. From its famous No. 130 Red Rod for getting deep penetration in dirty, rusty metal to its No. 15 Presto-Arc rod for high speed welding of sheet metal, Marquette offers the best for any shop. This range of rods includes high tensile, hard surfacing, cast iron, special alloys and bronze rods.

WRITE FOR THESE FREE FACT-PACKED BULLETINS

1 The 90 Series Arc Welder
2 Jet Series Welding Torches
3 "Guide to Better Welding"

When it Comes to Welding Come to

MARQUETTE
WELDING EQUIPMENT

Marquette Manufacturing Company, Inc., 307 East Hennepin Avenue
Dept. 6-420, Minneapolis 14, Minnesota

in making bends in conduit—heavy wall and thin wall. We have witnessed sorry sights during examinations when applicants have been asked to actually bend conduit according to a sketch. Some may say, "He will get that on the job." Sure he will, provided he gets the job and it is our duty to prepare him for the job first. Again, there might be an objection raised due to cost or lack of needed materials. With a normal amount of thrift much of the material can be used indefinitely.

Here again our electrical industry can be called on to cooperate. We do not proffer unlimited subsidy nor do we advocate giving assistance for purposes of obligation. Nor should there be any such feeling. We cannot speak for the 48 states but from our local industry standpoint we can say it has been done and will probably continue just so long as we are interested in programs which are developing manpower for the future.

The National Code

It is obvious that this practical work should be extended to all fields—industrial, commercial, and residential. For the first two mentioned, motor circuits with starters, relays, and protective devices installed are most important. Then we encounter larger installations including high-voltage bus-bar installations, transformers, remote control multi-wire circuits, and other more intricate phases of electrical construction. Requirements for these installations should be carefully studied and observed.

The source of this information is generally speaking, the National Electrical Code. In most metropolitan areas where there is average density of population you will find this Code as a minimum standard. This is the "law of the industry." By and large if a student can learn the important provisions thereof and apply them practically, we are well on the way to having a good prospect for the electrical industry. Some communities adopt local requirements in addition to the Code. These should also be made a part of the instruction.

Finally, a few points on legislation. Most areas in which there is a fair density of population will have some electrical laws in effect. These can be either state-wide or local in character. They generally include the following:

1. Establish minimum standards.
2. Establish inspection departments.
3. Require contractor's and journeyman's licenses.
4. Provide qualifications prior to licensing.

The National Electrical Code as approved by the American Standards Association is usually adopted as a minimum standard. Local authorities are appointed to inspect the installations with a view to the protection of life and property by compliance with standards as set forth. Licensing requirements are usually included in order to insure the public that qualified persons are doing the work. In addition to requirements that examinations be passed, most laws set forth a nominal amount of practical experience in addition to technical training, or in lieu of technical training a longer period of practical experience. Thus we can see that trade-school training is a very important consideration. It is not uncommon to require four years of practical experience or three years of training in an accepted trade school and one year practical experience as prerequisite to acceptance of an application.

We believe that if students are made aware of these requirements and standards during their period of instruction, they will appreciate the value of it. Again, we must recognize that many areas do not have compulsory laws. We do not believe that this should be of any influence in determining the training to be given. On the other hand, we do feel that by using this as a basis all students will be better qualified for industry work.

In conclusion, we feel that the electrical industry affords a great opportunity for the student of today. In the residential field for instance, ten years ago there were some 15 to 20 commonly used electrical appliances. Now there are approximately 56. Ten years ago the average KWHR consumption by residential customers was in the neighborhood of 1200 to 1500 per year. Today that is in the order of 2500. One authority in the electrical field recently made the statement that no other industry has produced as many new products since World War II as the electrical industry. Electricity is contributing very much to the high standard of living of today. We feel tomorrow will evidence more of the same. Research engineers are looking forward to "push-button" living. In this plan electricity will be the motivating agent.

This same trend exists in commercial and industrial fields. We do not have to look too far to fully appreciate that the chores of the worker are continually being lightened by application of electrical equipment. Consequently, we believe the electrical industry offers unlimited opportunity to the youth of today in its many branches. ★

Machining . . . . . *from page 33*

2. Can you do more to enlighten youth on how our business system operates? New industries? New inventions? New products? New occupations? Production methods? Distribution?

3. Along with the vocational teacher can you develop within each student better attitudes toward work and the dignity of labor? Selling the student on the idea that there *is* room at the top for those with ability and persistence? Asking your guidance department to do a better job in guidance—and so important, teach young people how to go about getting a job? Industry today is looking for young people with growth potential — and students need help in selling their assets to the employer.

4. Do you keep up-to-date on current styling methods, design, and techniques of human engineering?

5. Can we do more on developing pride in workmanship? Confidence in the student's own ability?

6. Human relations is all-important in industry — in fact, a successful enterprise must have good human relations to succeed. What are you doing to assist your students to understand themselves and others better? Should they know that today's psychological tests can do much to give them assistance on their long and short suits?

7. How about better planning and organizing of students' work and time?

8. Should students know more about the line-and-staff organization of today's business? And their functions?

9. Could more be done to enrich the occupational areas so that young people will better understand the complexity of opportunities available to them?

10. Can you assist the guidance and vocational departments so that students are better selected for vocational subjects?

11. In line with cost-consciousness, should students know more about working with an operational budget?

Things to Come?

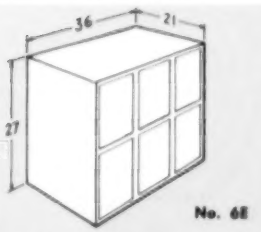
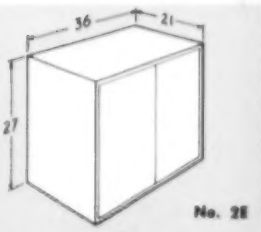
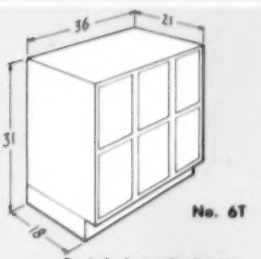
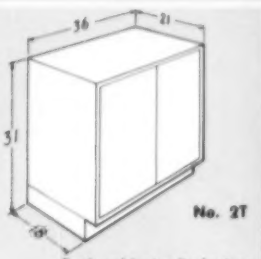
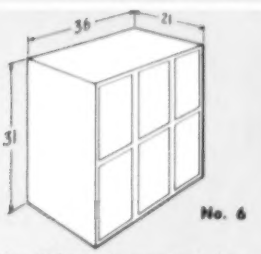
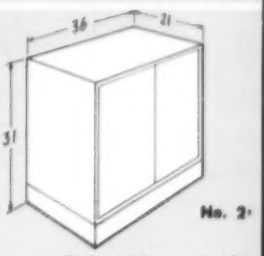
There will be those who say that industry is again asking for more curricular enrichment to the detriment of basic skills and knowledges. This is not so, for what is being suggested is a more critical awareness of the changes in industry in order to have a dynamic curriculum. The writer believes that the vocational graduate should have basic foundational skills and knowledges followed by more

A coordinated line of multi-use units that offer flexibility and grow-ability

H&S Shop Bench Units

Howard and Smith, Inc.
BENCH TOPS
of any size, in genuine TOLCO quality
BASIC UNITS
all-steel lockers or cabinets in two colors
BENCH RISERS
to make up toe-recessed or flush-front assemblies

Typical wall bench, using the new H&S toe-recess locker (No. 6T).

LOCKER TYPE	CABINET TYPE
 No. 6E	 No. 2E
Basic locker unit for elementary and junior high use, 27" high	Basic cabinet unit for elementary and junior high use, 27" high
 No. 6T	 No. 2T
Basic locker unit plus toe-recessed riser, 31" high	Basic cabinet unit plus toe-recessed riser, 31" high.
 No. 6	 No. 2
Higher locker unit, roomier lockers 31" high, for High School and College	Basic cabinet unit plus flush-front riser, 31" high

The basic locker and cabinet units are of identical overall dimensions, to allow their combination in forming various assemblies. While the basic locker units contain six lockers, they can be unbolted to form three smaller two-locker units, thus increasing their flexibility.

The basic units plus 2¼" thick tops form ideal working heights for elementary and junior high school students. Older (and taller) students are accommodated by the addition of a 4" riser. This may be of the flush-front type where tops extend out sufficiently, or of the toe-recessed type where they do not. This toe-recessed riser, unique with H & S units, prevents needless damage to locker and cabinet doors and provides a more comfortable working position for the student.

Genuine TOLCO bench tops are supplied in any width, length, or thickness that is required. TOLCO tops are constructed of ¾" wide full length strips of northern hard maple. They are electronically glued and strengthened by concealed steel tie rods. Lacquered, galvanized steel, or acid resistant surfaces may be had.

See other side for typical H&S shop benches

Shop, Laboratory, and Art Benches

These standard assemblies all utilize H&S Shop Bench Units, Tops, and Risers. Single, two, four, or six student work benches, and island base and wall type assemblies may be made by using these same components. Many standard assemblies other than those shown here have been worked out and are sold as complete units. However, the flexibility of the basic units permit an infinite number of variations.

Model T-64, senior height four-student bench.

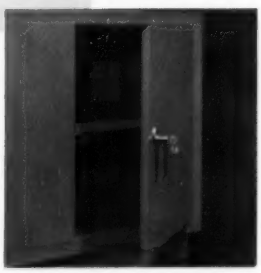
Model T-62E, junior height two-student bench.

Model T-21T, senior height one-student bench.

Model TIS-64E, junior height four-student crafts bench.

Model TWC-10T, wall bench using toe-recess lockers (No. 6T) and toe-recess cabinet (No. 2T).

Quality Features Found on All H&S Shop Bench Units



LOCKER TYPE

Locker doors are ventilated and provided with sturdy friction-closure padlock catches. They don't rebound when slammed shut. Heavy hinges withstand long hard use. Locker bottoms are flush with sills to allow easy sweeping out. Each 2-locker section is of welded heavy gauge steel, with baked enamel finish.

CABINET TYPE

A heavy gauge steel unit. Cabinet doors have a heavy satin chromed lock for safe storage of supplies. Cabinet shelves are fully adjustable, to suit your needs. Additional shelves may be added. Both cabinet and locker type units are available in two colors: Castillian Green or Light Cadet Grey.

Howard and Smith, inc.

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Colonial Cobbler's Bench. Easi-Bild* Pattern #586. Just trace, saw, assemble. Send 50¢ in cash or money order to Elmer's Pattern Dept. 46, P. O. Box 215, 350 Madison Ave., New York 17, N. Y. *T.M. Reg. Easi-Bild Pattern Co., Inc.
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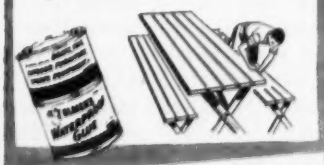
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specific training in industry. What has been suggested is that in some cases—far too many — industrial educators have not kept pace with our changing industrial world.

The machining industry is changing —not evolutionary, but almost revolutionary. Will your graduates be ready? If not, who is to blame? ★

Directors' View . . . . . *from page 5*

This pattern of occupational preparation has many advantages, one of the most significant being the making of modern production facilities and equipment available to youth for learning purposes. One of the disadvantages is that cooperating employers may tend to think of it as merely a terminal type of education preparing workers primarily and specifically for employment with their own firms.

Training directors state that the school should be careful not to establish any practice or organizational structure that would keep youth from reaching their highest potentialities. We would assume, from this, that firms engaged in cooperative programs would accept the same policy of willingly allowing youth to quit their employment after the cooperative program to attend colleges or universities, if they so desire.

Training directors, in their remarks, state that there is an advantage in having a variety of occupational-preparatory patterns rather than any *one* pattern. America's many "free-style" patterns of occupational and economic preparation are among its greatest assets —they are a part of our great democratic process; we should not attempt to adopt rigorous patterns of occupational preparation similar to those in some other countries.

The Proper Balance

What is the proper relationship of, and balance between, the school's general-education services and its occupational-preparatory services to youth entering industrial employment on the skilled or semiskilled levels? Most training directors believe that these youth should begin their occupational preparation during their secondary-school years. They feel that the school should provide a program which would include both general-education offerings and occupational-preparatory services, and that youth should experience these together, preferably during the later secondary-school years.

Training directors believe that the school should continue to emphasize the fundamental general-education subjects,

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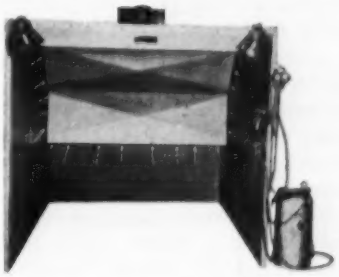
Paasche offers a complete range of dry booths, airbrushes, air regulators and guns for every school shop finishing need and budget.
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hours (approximately) of the course, especially the language arts, mathematics, and sciences. Some expressed fear that the school would neglect these subjects in favor of a purely occupational preparatory program for youth entering industrial employment. The survey findings support a balanced and integrated program of general- and occupational-preparatory offerings provided side by side in the secondary school.

Training directors admit that they have no right to tell educators how to operate the public secondary school. They do feel that the public school should advise with a number of different interested groups in the community when attempting to set up or modify industrial-education programs. Training directors are interested in these programs; they can be counted on as supporters of them. As industrial educators, you need their cooperation. Look up the nearest chapter of the American Society of Training Directors and make yourself acquainted with its members. ★

Electronics ..... *from page 46*

hours (approximately) of the course. Using a breadboard trainer, the student is able to perform all the basic experiments — from d-c right through a complete working radio receiver. Preferably, the trainer should feature plug-in components and be designed for the rapidity of circuit connections. Most of the students' time should be spent in testing out the circuit so that a time-consuming "building" program can be eliminated.

After the basic circuits have been mastered on a trainer, it is recommended that the student immediately proceed to commercial radio receivers—testing, aligning, and troubleshooting. Actual work on commercial TV receivers is continued when the student starts television. This emphasis on basic circuit understanding and practical work on commercial receivers should give the student the necessary know-how to do a good job when he enters the commercial field.

The electronics industry has an obligation to help schools carry out programs in the interest of the industry. However, schools and particularly those individuals responsible for the teaching of electronic subjects also should make an effort to know the industry and what it is doing or can do in the fields of industrial arts or vocational training. Electronic products are becoming so commonplace that at least one of the many manufacturing, distributing, sales, or service facilities will be found locally. Teachers, therefore, need not go beyond their own community for assistance. In fact, RETMA educational and training programs are designed to be used by schools with the cooperation of local industry advisory groups. ★

Industry ..... *from page 7*

of this industrial age and the opportunities available."

"Impress all people in our educational system with the importance and dignity of work. Emphasize the dire need for this type of education and stress the contribution made by everyone making a living in industry."

"Develop a better understanding and appreciation of the individual's responsibility toward improving productivity . . . stress the 'work smarter, not faster' philosophy. Students should be impressed with the fact that no one knows everything, but by cooperation, all can learn much."

"Create a desire for fine work, rather than volume, or at the same time as production is maintained."

"Teach the value of time as well as how to do jobs."

"Put more emphasis on treating tools and machines with respect. Develop an appreciation of their cost and proper attitudes toward their maintenance."

"Develop leadership qualifications. Encourage students to become tomorrow's supervisors."

"Stop trying to make it easier for the student to get a passing grade to insure his promotion."

"Amend and enforce laws requiring minimum attendance in schools."

And, in conclusion, "Carry on long-range follow-up studies of industrial-education graduates."

It is easy to criticize, says one industry spokesman, especially when a company's particular needs are localized. The schools have the problem of keeping up their academic standards and the difficulty of fitting individual instruction into a general program. The question of accepting responsibility for the proper education of students whose entrance credits do not meet with their minimum standards does not offer an easy solution. Most schools will answer that question by suggesting that a specialized program be developed by the company itself, taught by instructors supplied by the company under school guidance. This can work only if there are sufficient numbers of students to support the program.

His Leisure Time

Asked about what is being done in industrial education in the schools that is helpful to the employe in the use of his leisure or other time, as well as weaknesses or failures in this area which would handicap the employe, many of the companies answering showed a great interest in a program to aid youngsters and adults in becoming well-rounded personalities.

They say:

"Within the limits allowed students to take industrial arts or trades training, it is my opinion that our local schools are doing an excellent job of showing the value of craft work that can be profitably used in the leisure time of the student, both while he is in school and as an adult. I think the present do-it-yourself trend has and will awaken a greater interest on the part of young people in at least taking some industrial-arts course, if not for vocational use, to equip them for greater enjoyment of leisure-time activities."

"There seems to be an effort to get everyone into a club or activity which teaches students to get along with other people."

"There are many special interest programs available and special craft courses offered at night schools which offer an excellent opportunity for employes of all educational levels to pursue their studies — increase their potential value to their employers and increase their earning powers through ability to meet the needs of increased responsibility."

"The basic skills and knowledge acquired furnish the basis for healthy hobbies, promote selfconfidence, broaden interests, provide a framework for enlarging personal associations."

"To the nonvocational students of industrial arts, they are giving an appreciation of the joy and satisfaction

Working with Light

A brand new program of inexpensive teaching aids

In almost every shop, lamps and other lighting projects are constructed during the year. And yet, up till now, students have seldom had available information on the principles of good lighting and how to incorporate these principles into an attractive and worthwhile project. Recognizing that lighting cannot be introduced as an area in the already crowded I.A. curriculum, Better Light Better Sight Bureau has produced a flexible group of supplementary study aids to provide teacher and student with project and reference materials which can be fit into woodworking, metalworking, and other areas.

Materials include a 100-page "Lighting Handbook," for use by the teacher and as a reference book in the planning area; 12 project leaflets; and a student reference folder.

For more information about this program, consult your local electric company or write for free descriptive folder to

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of working with tools in creative efforts, something that every healthy-minded person needs to remain healthy-minded. This is especially true for students who will eventually earn their living with their heads rather than with their hands. It is particularly needed after retirement."

All of the answers were not bouquets. Here are some typical criticisms:

"There are some indications of an unrealistic approach to establishing the individual's goals in life. In many cases a lack of understanding of the factors that contribute to successful achievement of personal goals is missing. The wise use of leisure time is so important in working toward such goals."

"They lack an appreciation of the arts. It is an inability and lack of a desire to read with understanding and appreciation any literature above the comic-book and paperback-novel level. Associated with this weakness is a limited vocabulary that can be a decided handicap when these young people reach the stage in their career where promotions pass them by because of their inability to converse with intelligence and conviction."

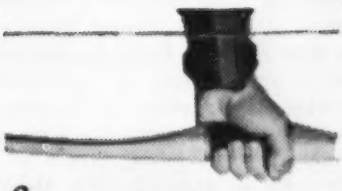
"The sad fact is that students of vocational industrial arts do very little reading of newspapers, less literature, current events, history, and problems of democracy. This has an effect on how good a citizen they may be in voting. Philosophically, it might have some effect on finding enjoyment at home rather than away. However, we do not make it a practice to 'interfere' in our employes' home life or leisure time."

Something to Think About

Typical comments as to how industrial education in the schools may provide the training which may better serve the employe in the use of his leisure or other time include these remarks:

"The home and the school should encourage pupils to use their leisure time for wholesome activities that will supplement their field. They should be told to keep on studying — go to college if possible — that learning is a continuous process. Never stop trying. A person is never a finished product. When you think you are finished, you really are finished. An effort must be made to overcome the handicap that comes from the need for specific technical knowledge and shop experience that sometimes retards the over-all cultural development of the individual."

"Provide spare-time training where not available, publicize its existence and



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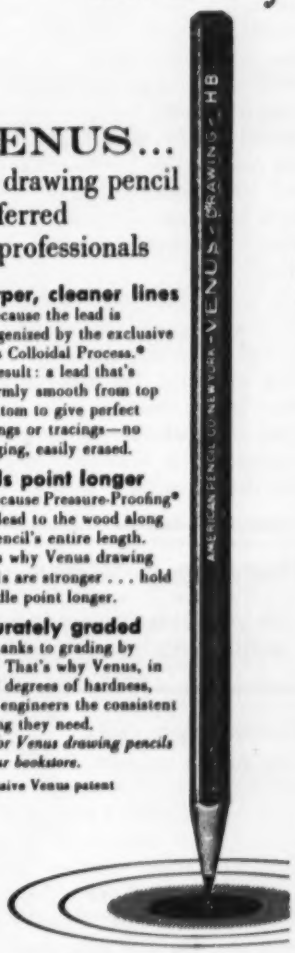

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stress the possibilities of a rewarding future in industry through attendance at these sessions. Encourage the practice of getting ready for opportunities to step up the ladder. It's too late to start when the opportunity is already there. Help the young person to set his sights on attainable goals. Motivate him to constantly work toward such goals and aid him in planning the steps toward attaining them."

"Develop an appreciation of companionship, the social amenities and the art of conversation and group discussion which depend on reading—whether of newspapers, magazines, literature, history, or current events. Encourage the full use of school libraries and more active participation in clubs and other social activities. Throw as much emphasis on 'man as a social being,' as on 'man as an economic being.'"

It is suggested that industrial-education teachers study these comments for the light they may throw on their own work situations. The material may well serve as the starting point of a program of profitable industry-education cooperation if teachers are ready to take the initiative. ★

Here Is a Way . . .

to publicize your industrial-education program

Televised Shop Class

In Buffalo recently, William Conley and a group of his boys from School No. 3 went through a regular shop class on the "Your Schools at Work" television program. Station WBEN-TV studios were fitted out with regular industrial-arts benches, a drill press and scroll saw. The boys went about working on their regular projects just as they would have normally in their regular shop class. The range of activities that were televised included woodworking, metalworking, and electricity.

Topping It Off

Monterey, California, Director of Industrial Education Marvin Holman has arranged a project for carpentry students in Ben Patterson's class that provided the boys with some real-life experience. Along with union groups and civic organizations the students have played an important part in building the Monterey Youth Center. Most recently they have topped-off the project by completing the roof of the center. ★

Diamond Dust

Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.

The Loyal Order

A STORY is told about a boy who announced to anyone who would listen that the American Army is the finest army in the world. He was of the opinion, too, that the 32nd Division is the best Division in the American Army, and Company B is the best company in the 32nd Division. Not only this, but he was firmly convinced that his brother Bill is the finest soldier in Company B. This lad was loyal. Loyal to his country and to his family.

But loyalty appears in many places and in many forms. We may be loyal to our country, to our church, to our political group, to our school, to our team, or to any other organization or group to which we are attached. Even some criminals display loyalty to their associates.

You may ask, what does loyalty involve? In general, it means that, right or wrong, we are prepared to defend our organization. We owe it our confidence and support, and we are willing to serve it to the limit of our capacity. We may criticize it within the group, but we are willing to fight for it against criticism from without. We do not belittle it to others who are not members of the group, nor do we countenance derogatory remarks concerning our associates from others.

And so we find that we, as shop teachers, are part of certain groups to which we owe our loyalty. We belong to the shop teachers' group as a whole. Then we are more intimately associated with the shop teachers in our schools. These shop teachers are parts of larger groups composed of teachers of other subjects in the schools to which they are attached. This larger group is enlarged still farther when we remember that the administrators and the boards of education are also members of our gang.

If we are to be loyal to this total group, it is imperative that we encourage and support our colleagues to the limit of our ability. When a school policy has been established, the teacher who acts in a manner that tends to hinder its operation is disloyal. We must give each member of our team — and this includes the administrative and supervisory staff—credit for doing his job as well as we believe we are doing ours. We must avoid taking the attitude that if Jack Jones or Jim Smith were only half as good as we think we are the staff would be more effective. And we must avoid blaming the teachers of English, science, or mathematics for not teaching their subjects effectively. We must be active in convincing our critics that all of the subjects taught in our school are necessary parts of a total curriculum. And we must be conscious of the need for maintaining the high standards aimed at by our teammates in the school in which we teach.

Loyalty is a characteristic which calls for constant vigilance on the part of every teacher to the end that the team to which he belongs can work together harmoniously for the common good. ★

*strictly personal

CHARLES H. SECHREST, former industrial-arts teacher in the Detroit, Mich., public schools, has been appointed associate professor in the industrial teacher education department of Wayne University, Detroit.

ERNEST C. COMSTOCK has resigned as Colorado state director of vocational education to accept an assignment with the International Cooperation Administration as educational adviser in technical education at Baghdad, Iraq.

MILTON CUMMINGS is now acting principal at Paul Revere Trade School, Rochester, N.Y., succeeding FREDERICK RAAB, retired.

JOHN J. HARRIS, formerly acting chief of the trade and industrial education division of the Michigan State Office of Vocational Education, has been appointed chief of the division.

RAY E. HAINES, professor in the department of vocational education, school of education, New York University, has announced his retirement at the end of this school year.

ROBERT L. OGLE, formerly instructor at Rule High School, Knoxville, Tenn., is now instructor of metalworking at Memphis State College, Tennessee.

CLYDE C. CLACK of Binney & Smith, Inc., captain of the Ship organization in 1952-53, died on December 24.

PAUL SPRINGER has been named acting principal at Edison Technical and Industrial High School, Rochester, N.Y., replacing HOWARD BENNETT, retired.*

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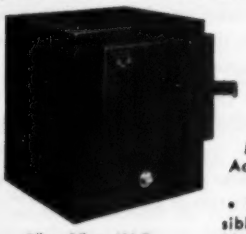

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happenings in industrial education

AIAA Convention

SEVERAL unusual features are in store for the industrial-arts supervisors, teachers, and trainees when they attend the 19th annual convention of the American Industrial-Arts Association in Milwaukee, Wis., April 24-27.

One of the unique features will be the first exhibit of teachers' master craftsmanship, in which teachers of industrial arts throughout the country will exhibit some of their own handiwork.

Another unusual exhibit will be a 10-panel "Civilization through Tools" exhibit, prepared by the Wilkie Foundation for the DoAll Company. This will mark the first appearance of this exhibit at any school convention.

Other exhibits, in addition to the commercial displays, will include an exhibit of students industrial-arts work, an exhibit of examples of furniture designed by some of America's outstanding furniture designers, and an exhibit of 68 prize-winning projects in the Ford Industrial Arts Awards.

Demonstrations will also have a prominent part in the program. Harry Goldstein of Tucson, Ariz., will demonstrate the making of Polaroid slides for visual aids. Student teachers from 12 midwestern colleges will give a series of demonstrations, illustrating new techniques for giving class demonstrations.

The four-day convention will open with separate meeting of the teacher-training and supervisor groups. Presentation of the new yearbook and the "man of the year" award in education will be made at a noon luncheon Tuesday. Harold S. Vincent, superintendent of Milwaukee Public Schools, will be the speaker at the annual banquet Friday.

Roy A. Radtke, supervisor of industrial arts for Milwaukee Public Schools, who is first vice-president of the association, is chairman of the local arrangements committee for the convention. J. Ely Van Hart, Elizabeth, N.J., is convention director. Burl N. Osburn, Pennsylvania State Teachers College, Millersville, is president of the association.

Credit from Industry

APPROXIMATELY 40 teacher-training institutions in this country now have provisions for giving college credit for enrollment in the automotive courses maintained by industry. This fact was recently disclosed by A. D. Althouse, supervisor of vocation education in Detroit, Mich., and chairman of a committee of the National Association of Industrial Teacher Educators (NAITE), which has been at work on the problem for the past two years.

The industry automotive schools have formed an organization to work with the NAITE committee. This organization, called the Automobile Industry Training Conference (AITC), has prepared criterions which establish standards for programs which are to be accepted for university credit. Frank P. Plovick of the Delco-Remy Division of General Motors Corporation, is chairman of the AITC.

The NAITE committee has recommended that one semester hour of university credit be allowed for 40 hours of school instruction taken in any of the schools which are members of the AITC. Colleges in the following states now have made some provisions for giving credit for industry courses taken: California, Colorado, Florida, Georgia, Illinois, Indiana, Kansas, Louisiana, Michigan, Missouri, Montana, Nebraska, New Mexico, New York, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, and Wisconsin.

Members of the NAITE committee which have worked on this problem include, in addition to Chairman Althouse, G. H. Silvius, Wayne University; William J. Micheels, University of Minnesota; M. Ray Karnes, University of Illinois; E. W. Tischendorf, Kent State University; John J. Jarvis, Stout State College; Paul Powell, Long Beach, Calif., State College; and Mr. Plovick, secretary.

Oklahoma Field Day

THE seventh annual Field Day of the Oklahoma Trade and Industrial Educational Club will be held in Oklahoma City, April 26-27, as part of the Southwest American Exposition.

Last year more than 600 students and instructors participated in this event. At least an equal number is anticipated this year. As part of the activities an outstanding craftsman award is given a student. Last year's winner was Thurman Watson, a drafting student at Shawnee, Okla., now employed as a draftsman in the aviation industry.

School Addition

BIDS totaling approximately $241,000 were recently awarded for the construction of a two-story addition to the shop and technical building of the Milwaukee, Wis., Vocational School.

The new addition will provide quarters for the carpentry and pattern-making departments, which now are centered in annex buildings. The addition also will include a large demonstration classroom.

Convention Calendar

Washington Industrial-Arts Association, Spokane, April 6-7.

Michigan Industrial-Education Society, Sheraton-Cadillac Hotel, Detroit, April 12-14.

New York Vocational and Practical-Arts Association, Hotel New Yorker, New York City, April 12-14.

West Virginia Industrial-Arts Association, Jackson's Mill, April 13-14.

Connecticut Industrial-Arts Association, Spring Conference, Teachers College of Connecticut, New Britain, April 20-21.

Missouri Spring Conference on Industrial and Distributive Education, University of Missouri, Columbia, April 20-21.

Nebraska Industrial-Education Association, Nebraska State Teachers College, Kearney, April 21.

Utah Industrial-Arts Association, Provo, April 21.

American Industrial-Arts Association, Milwaukee, Wis., April 24-27.

Wisconsin Association for Vocational and Adult Education, Loraine Hotel, Madison, May 4-5.

Industrial-Arts Spring Conference, New York State Teachers College, Oswego, May 10-11.

North Carolina Industrial-Arts Association, Greensboro, May 11-12.

Georgia Vocational Association, Biltmore Hotel, Atlanta, June 7-8.

General Shop . . . *from page* 23

6. Pick your "targets." Determine where you can make the greatest contribution in the total program of education and concentrate on that.

7. Admit there are limits to what you can accomplish with a group of students in the time you have allotted to you. Industrial-arts education is *not* a cure for *all* educational ills.

8. Plan your program so as to attract students who have the intellectual capacity to understand today's technology and the potential for putting it into purposeful use. In too many instances the industrial-arts program is "geared" to those with a lower level of intelligence.

9. A continuing program of adult industrial-arts classes provides effective means for improving taxpayer relations.

10. "Skills" are admired and respected in all endeavor of man. This has been since the beginning of time. Let us not discard or deemphasize skills in industrial-arts teaching.

11. By your thoughts and actions, show pride in your profession. ★

large face plate turning

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parts finishing

metal spinning

wood turning

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You can plan to do more projects, different projects with the really versatile VS-55 Lathe. This economical lathe for both woodturning and metal spinning handles a 12" swing over the main bed . . . 16" swing over gap . . . rear face plate swings large pieces for turning.

Safe, simple operation . . . Speed control interlocked with "start" switch . . . built-in tool storage . . . wooden shelf protects cutting tool edges.

Plan now to have a Blount VS-55 Lathe in your shop . . . leading schools throughout the country have made it their choice. For details, ask for Bulletin SD-14.

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Manufacturers of Wet Tool Grinders, Woodturning and Metal Spinning Lathes

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new heavy duty cabinet models . . . by DURO

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Send for FREE Power Tool Catalog and Shop Planning Guide

See firsthand how Duro power tools will fit your shop and budget. There are many units to choose from including circular, band and scroll saws, lathes, jointers, drill presses, disc and belt sanders, etc. The Duro planning guide will give you a clear insight into proper shop planning. Write today . . . both are free.

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KINKS

Payment will be made for each Kink published. Send to Editor, School Shop, Ann Arbor, Mich.

Easy Pencil Pointer

This is probably an old kink but perhaps there are some drafting teachers who aren't familiar with it. Place a piece of very fine sandpaper around the inside edge of a clean baby-food can. Use action similar to that of a revolving mechanical pointer. My students like this method better than the sandpaper-paddle pointer because the powdered graphite falls to the bottom of the can and not on the drafting paper.—*Chester W. Korber, North Hollywood, Calif., High School.*

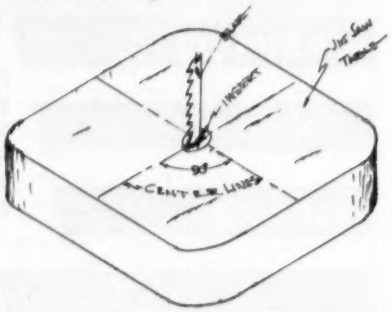
No-Tip Gadget

Here's a simple, practical idea for keeping drawing-ink bottles from tipping over. Cut a 1" pine board or similar material in a 4" square. Drive three 4-penny box nails about equally spaced around the ink bottle close enough so the nail heads will prevent the bottle from dislodging.—*Leonard M. Maunu, Milwaukee Vocational School, Milwaukee, Wis.*

Shoe Dye as a Substitute

Ever run out of layout fluid when you're in a hurry? Here's a suggestion for temporary layout work. Buy a bottle of black or brown shoe dye and apply this in the same fashion as the layout fluid. In some cases two coats are needed, but in ordinary circumstances one coat will be sufficient.—*N. J. Gould, Albert Bushnell Hart Junior High School, Cleveland, Ohio.*

The Line-up



CENTER LINES ON JIG SAW TABLE

Paint or scribe two, thin 90° center lines on the jig-saw table top in order to assist you in lining up the work and to help in cutting straight lines. It's a big time-saver.—*N. M. Pittman, Overton, Tex.*

Housekeeping Kinks

For rust protection, paste wax makes a fine covering on all exterior parts of shop machines. The wax also makes cleaning much easier.

When dusting, I use a hand vacuum cleaner to blow off the dust. Remove the bag and fasten the crevice attachment on the dust-bag connection, making a blower. You can clean equipment faster and do a much better job with this gadget. The blower is also handy for cleaning dust and dirt out of electrical motors on power equipment.—*Ed Lancaster, Orange City, Iowa, Public Schools.*

Color-Code the Keys

Keys which are frequently used in the shop are often hard to pick out, especially if the bunch holds a number of them that are nearly identical. We solved this problem by color-coding keys and locks with paint or lacquer, using a different color for each lock.

Heavy Duty Vertical Milling Attachment

Heavy Duty Offset Vertical Milling Attachment

Universal Milling Attachment

Rock Milling Attachment

Heavy duty attachments increase versatility of dependable, low-cost

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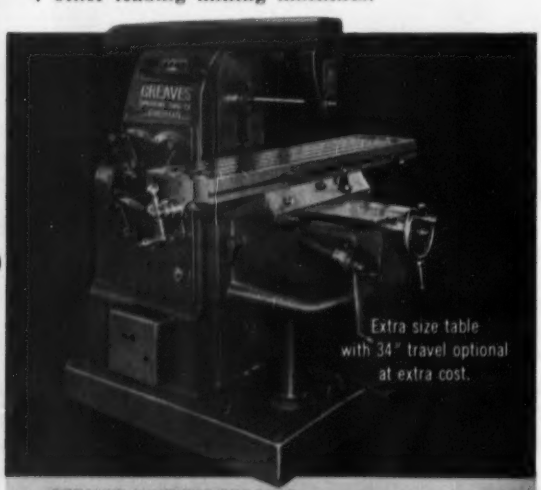
"THE MOST MILL FOR THE LEAST MONEY"

A full line of attachments and accessories offer outstanding flexibility for all types of milling operations in the school shop. Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.



Extra size table with 34" travel optional at extra cost.

Send coupon for FREE Comparison Chart and detailed descriptive literature, on easy-to-use attachments.

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Send Comparison Chart. I will make my own comparison of GREAVES MILLS with other makes.
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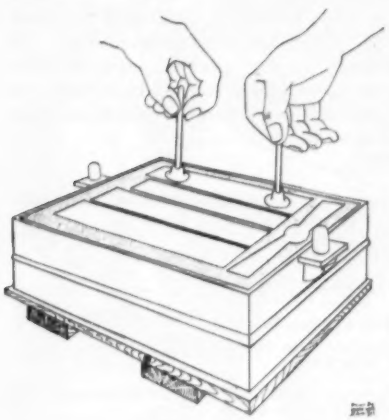
FIRM _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

If there are no surfaces to really hold the color, mark the keys or lock with center-punch marks. These indentations will hold the paint or lacquer.—*Carl H. Hubachek, Branford, Conn., High School.*

Handy Lifters



In foundry shop, we do a certain amount of advertising by making personalized name plates for the desks of administrators, faculty members, and secretaries of our own and neighboring schools. We always encounter difficulty in drawing the name plate pattern from the sand since the conventional draw-spike may not be used. If the back plate is made of wood the spike point may penetrate the pattern and perhaps strike a letter on the other side, defacing the mold. If the back plates are made of cast aluminum, as we do them, they are equally hard to get hold of, but will give many years of service.

Here are two simple methods for drawing name-plate patterns from the sand without disturbing the delicate detail that is formed by the letters.

1. Roll a piece of modeling clay into a cylinder about ¾" in diameter and 4" long. Press one end of the cylinder firmly to the pattern so that it adheres and then draw.

2. Obtain a pair of toy gun darts from a dime store which are equipped with rubber suction cups. Moisten the cups before applying to the pattern. They will grip the pattern very effectively so that the draw can be made.—*Edward Saks, Murrell Dobbins Vocational-Technical School, Philadelphia, Penn.*

Less Fall-Out

When a cloth bag of parting powder is shaken over a pattern, much of the powder flies out into the air forming a cloud of dust, but most of it never reaches the pattern. You can halt this waste by substituting an empty talcum-powder can which has a snap-on lid. Ladle the parting powder into the can, place a piece of cloth over the top of the can, holding it in place with a rubber band. A light tap on the talcum can will then direct the parting powder into the right places without waste.—*Louis Enos, Lincoln Junior High School, Sacramento, Calif.*

Traffic Situation Eased

Now that the current trend is to four-station work benches, trips to return tools has become a general problem. We successfully use individual tool panels on the unused ends of these benches. The panels service two vises or stations and have an individual color for the panels and the tools they hold.

Our panels have places for a shared brush and back saw, with individual planes, try squares, and rulers, each with a spot of color to match the panel. When class ends a simple admonition to "check your panel," or a quick spot check by the instructor leaves only the main panel or cage to look over. This system reduces student traffic to a low rate or at least leaves few excuses for wanderings.—*John H. Buekers, Frost Institute, Jackson, Mich.*

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and
LOOSE-LEAF BIND
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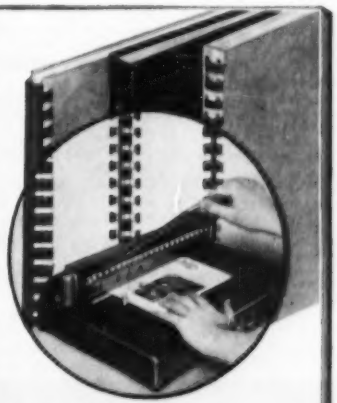
manuals—presentations
all types of literature



NOW, all GBC punching accommodates the new multiple ring GBC Metal Loose-Leaf Binding as well as all Cerlox Plastic Bindings.

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Improve all your literature...guarantee maximum attention and action for every message...and prestige, utility, color. Pages lie flat, turn easily, can be interchanged between GBC Metal Loose Leaf and Plastic Bindings. Efficient GBC machines cost no more than a standard typewriter. Anyone can operate.

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Please rush me my FREE copy of the new brochure "Now you can bind all types of literature..." I understand there is no obligation.

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Suppliers Directory

For the 13th successive year, SCHOOL SHOP offers to its readers this extensive and up-to-date guide to sources of equipment and supplies needed in shop work. Listed below are the manufacturers and distributors of more than 173 classifications of products, ranging from Abrasive Paper, Cloth to Wrenches.

This year the sources of supplies are listed first under the various classifications. Following this, starting on page 88, is the alphabetical list of all the firms included in the first section. To use the directory, look under the classification first to find the suppliers of the item needed, then use the alphabetical list for the addresses of the firms.

The Suppliers Directory has proved to be one of the most popular and helpful of SCHOOL SHOP's special features. Be sure to keep this issue handy, so that when you need supplies and equipment during the coming year you will know where to write for catalogs and information. Please be sure to mention SCHOOL SHOP when writing.

ABRASIVE PAPER, CLOTH

Boin Arts & Crafts Co.
Brodhead-Garrett Co.
D. W. Cope Plastics
Craftsman Supply House
Craftsman Wood Service Co.
DeWalt, Inc.
Eastern Handicraft Supply Co.
General Finishes Sales & Service
Howard & Smith, Inc.
Kindt-Collins Co.
M. D. Lee Tool Co.
Montgomery Ward
Plastic Parts & Sales
Plastic Products Co.
School Abrasives
Sears, Roebuck & Co.
Tepping Studio Supply Co.
Upholstery Supply Co.

ABRASIVE STONES, WHEELS

Alvin Co.
Brodhead-Garrett Co.
Craftsman Supply House
Craftsman Wood Service
Delta Power Tool
DeWalt, Inc.
Howard & Smith, Inc.
M. D. Lee Tool Co.
Montgomery Ward
School Abrasives
Sears, Roebuck & Co.
Upholstery Supply Co.

AIR COMPRESSORS

Brunner Mfg. Co.
Howard & Smith, Inc.
Montgomery Ward
Paasche Airbrush Co.

AIRCRAFT TOOLS

Berkroy Products, Inc.
Cincinnati Tool Co.
Delta Power Tool Div.
Duro Metal Prods. Co.
Lufkin Rule Co.
Millers Falls Co.
Proto Tools
Severance Tool Industries, Inc.
L. S. Starrett Co.
J. H. Williams & Co.

AIRPLANE MODELS, SUPPLIES

Craft Service
Gagers Handicraft

AUDIO AND VISUAL AIDS

Allied Radio Corp.
Aluminum Co. of America
Chas. A. Bennett Co., Inc.
Better Light Better Sight Bureau
J. R. Cooper
Crow Electri-Craft
Delco-Remy Division
DonJer Products Co.
Jam Handy Organization
Lincoln Electric Co.
Linde Air Products Co.
Lufkin Rule Co.
Magna Power Tool Corp.
McKnight & McKnight Publishers
Hazel Pearson Handicrafts
School Abrasives
South Bend Lathe Works
Stanley Tools
L. S. Starrett Co.
United World Films, Inc.
Walker-Turner Division
Young America Films

AUTOMOTIVE ELECTRICAL ASSEMBLIES

Delco-Remy Division

AUTOMOTIVE SHOP EQPT.

(See also Hand Tools, Mechanics)

Atlas Press Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Delta Power Tool Division
R. K. LeBlond Machine Tool Co.
Lufkin Rule Co.
Mall Tool Co.
Millers Falls Co.
National System of Garage Ventilation, Inc.
Parent Metal Products
Patterson Brothers
L. S. Starrett Co.
Tolerton Co.
J. H. Williams & Co.

BENCHES, SHOP METAL OR WOOD

(See also Shop Furniture)

American Type Founders Sales Corp.
Angle Steel Inc.
Brodhead-Garrett Co.
Challenge Machinery Co.
Albert Constantine & Son, Inc.
Craftools, Inc.
Howard & Smith, Inc.
Mayline Co.
Montgomery Ward
Parent Metal Prods. Inc.
G. A. Pratt Co.
Sears, Roebuck & Co.
South Bend Lathe Works
Stoner Wood Products Co.
Tolerton Co.
Wessendorf, Nelms & Co.

BENDING MACHINES

Formit
Imperial Brass Mfg. Co.
O'Neil-Irwin Mfg. Co.
Peck, Stow & Wilcox Co.
J. A. Richards Co.
Swayne, Robinson & Co.

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Brodhead-Garrett Co.
Chicago-Latrobe Twist Drill
Albert Constantine & Son, Inc.
Craftsman Wood Service
Delta Power Tool Division
DeWalt, Inc.
Greenlee Tool Co.
Howard & Smith, Inc.
Irwin Auger Bit Co.
M. D. Lee Tool Co.
Mall Tool Co.
Millers Falls Co.
Montgomery Ward
Price & Rutzebeck
Scott-Mitchell House
Sears, Roebuck & Co.
Stanley Tools
Upholstery Supply Co.
J. H. Williams & Co.

For Addresses of Firms See List Starting on Page 88

Your Students Will Learn FASTER on a PARKS PLANER

Students advance quickly on Parks Planers because they find them easy to operate, safe, and accurate. And, since both the Parks 12" and Parks 20" Planers have been designed and precision-built for accuracy and high-speed line production in industry, they are ideally suited for the school shop because they give practical experience on the type of machines your students will eventually use. Both machines are priced low enough for even the most modest shop budget.

The Parks No. 20. 20" Planer has a 4-knife cutterhead with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M., and 40 and 80 F. P. M. Will take work up to 20" wide by 6" thick. Ruggedly built for vibrationless operation.

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Write for complete descriptive literature.

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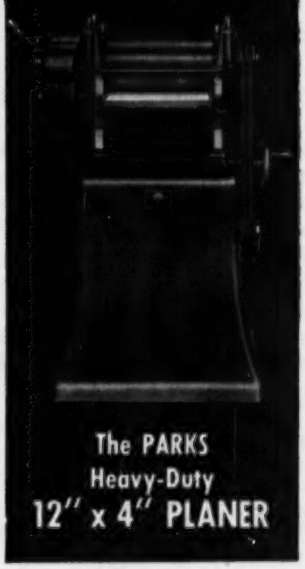

The PARKS WOODWORKING MACHINE CO., Dept. 22, 1546 Knowlton St., Cincinnati 23, Ohio

A FEW QUESTIONS
and ANSWERS to
help you decide on a
BETTER BAND SAW!
Wells Model 600—easy-to-use, easy-to-operate. Features blade tensioning. Capacity: Rect. 6" x 13"; Rounds, 6¾".

Q. Is it possible to get a small band saw that will handle all general class projects?

A. Yes! With a Wells Model 600, featuring large capacity and a ⅝" blade, your students will be able to handle a wide range of cut-off jobs.

Q. Is there something distinctive about the Wells Model 600 that invites students' interest and helps them to do a better job?

A. Yes, sir! It's the functional design, the attractive two-tone color scheme and the simplicity of operation.

Students learn quickly, it's so easy to use. Wells Exclusive Constant Load Blade Tensioning Unit is a positive device which enables each student to maintain correct blade tension. This means you will enjoy longer blade tool life, more accurate and better cutting performance.

Q. Is the Model 600 an economical machine tool?

A. Yes! Low initial cost—low operating cost. Budgetwise, the Model 600 is the ideal machine for any school shop, giving years of dependable, maintenance-free service.

Q. Are you training students for tomorrow's industry?

A. Yes, indeed! Develop the basic skills necessary to operate horizontal cut-off saws. Train them on a Wells Model 600, the same band saw they will use time and again in industry.

There are many reasons why the Wells Model 600 is best for *your* school shop. Contact your nearby Wells Dealer, today.

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The Pioneers of Horizontal

METAL CUTTING BAND SAWS

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First white glue worthy of the Weldwood name!

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- Sets fast!
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- Jobs can be machined 30 minutes after gluing!
- Bonds wood, leather, paper, cloth!
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New! "Does-the-impossible" adhesive!

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- Bonds instantly, permanently — *on contact!*
- Bonds any combination of wood, leather, glass, paper, cloth and metal (including aluminum)!
- Bonds Micarta and other laminates without clamps or presses!
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BS4-6

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BOOKBINDING EQPT.
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General Binding Corp.
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BOOKS
(See Publishers)

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(See also Hand Tools, Woodworking)
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Proto Tools
Sax Brothers, Inc.
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(See also Hand Tools, Woodworking)
Boice-Crane Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craft Service
Craftsman Wood Service
Delta Power Tool Div.
DeWalt, Inc.
Duro Metal Products Co.
Greenlee Tool Co.
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Millers Falls Co.
Frank Mittermeier
Montgomery Ward
Peck, Stow & Wilcox Co.
Sax Brothers, Inc.
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CHUCKS, LATHE & MAGNETIC
Boice-Crane Co.
Brown & Sharpe Mfg. Co.
Casting Specialties Co.
Delta Power Tool Div.
L-W Chuck Co.
Mall Tool Co.
Millers Falls Co.
Montgomery Ward
Sears, Roebuck Co.
South Bend Lathe Works
Wahlstrom Div., American Machine & Foundry Co.
Walker-Turner

CLAMPS, "C"
Adjustable Clamp Co.
Armstrong Brothers Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Craftsman Wood Service
Gunver Mfg. Co.
Howard & Smith, Inc.
M. D. Lee Tool Co.
Montgomery Ward
Sax Brothers, Inc.
Sears, Roebuck Co.
Upholstery Supply Co.
Wetzler Clamp Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.
X-acto, Inc.

CLAMPS, METALWORKING
Adjustable Clamp Co.
Armstrong Bros. Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Gunver Mfg. Co.
Howard & Smith, Inc.
Lufkin Rule Co.
Montgomery Ward Co.
L. S. Starrett Co.
Upholstery Supply Co.
Wetzler Clamp Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.

CLAMPS, WOODWORKING
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Columbian Vise & Mfg. Co.
Craftsman Wood Service
Gunver Mfg. Co.
Howard & Smith, Inc.
M. D. Lee Tool Co.
Montgomery Ward
Sears, Roebuck Co.
Upholstery Supply Co.
Wetzler Clamp Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.

CLEANERS, FILE
Cincinnati Tool Co.
E. C. Knudson Mfg.
Sears, Roebuck & Co.

CLOCK MOVEMENTS
D. W. Cope Plastics
Plastic Products Co.
School Products Co.
Standard Electric Time
Tepping Studio Supply
Ultra Craft Designs

COUNTERSINKS
Millers Falls Co.
Chicago-Latrobe
Sears, Roebuck & Co.
Severance Tool Industries, Inc.
Stanley Tool Co.
Upholstery Supply Co.
Whitman & Barnes

CRAFT SUPPLIES
Alvin Co.
Boin Arts & Crafts
Brodhead-Garrett Co.
Cadillac Plastic Co.
Castolite Co.
D. W. Cope Plastics
Copper Shop
Craft Service
Craftsman Supply House
Craftsman Wood Service
Craftools, Inc.
Dearborn Leather Co.
DonJer Products Co.
Dremel Mfg. Co.
Eastern Handicraft Supply Co.
Gagers Handicrafts Co.
John J. Fogarty
Gearon Co.
Giles & Kendall Co.
Gyro Lamp & Shade Corp.
House of Plastics
Jewelry Craft Supply
J. C. Larson Co.
M. D. Lee Tool Co.
Leisure Crafts
Minnesota Woodworkers Supply
Metal Crafts Supply Co.
Metal Goods Corp.
Frank Mittermeier
Modern School Supplies
R. Murphy Co.
Hazel Pearson Handicrafts
Plasticast Co.
Plastic Parts & Sales Co.
Plastic Products Co.
G. A. Pratt Co.
Rylan Electronic Corp.
Red Devil Tools
S & S Leather Co.
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For Addresses of Firms See List Starting on Page 88

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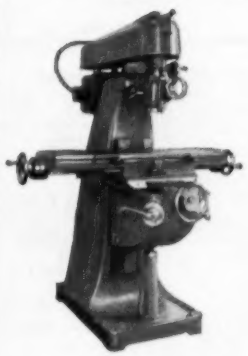
U.S.—BURKE Milling Machines offer ease of instruction on all standard milling operations, help teach fundamental principles through duplication of actual shop operations in miniature.

- **Perform All Standard Milling Operations**
- **Simple Operation Increases Value as Instructive Aids, Permits Practical Shop Teaching**
- **Within Cost Range of School Shops**
- **Accuracy Certified, Rigidly Built**

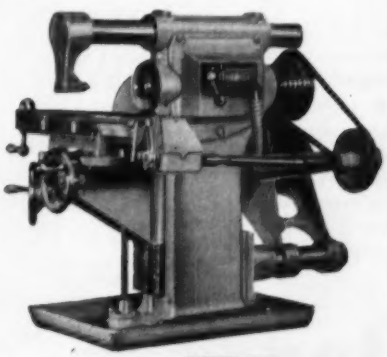
U. S. VERTICAL MILLING MACHINES



U.S. Vertical Mills—Fine grain alloy steel spindle • Spindle bearings prelubricated, sealed • 6 spindle speeds: 250 to 2850 RPM • 7" head travel • 1 HP drive • Many optional features.

BURKE BENCH MILLERS

Burke Bench Millers—2 hand, 2 power feed models. #9 B & S Taper • Heat treated, ground-spindle mounts in Timken bearings • ½ HP standard or gearhead, or ¾ HP Lima motor • 3 spindle speeds with standard, 12 with Lima motor • Range 66 to 2875 RPM depending on motor selected.



WRITE FOR FULL INFORMATION AND QUOTATION

U·S·Burke

MACHINE TOOL DIV.
5 BROTHERTON ROAD
CINCINNATI 27, OHIO

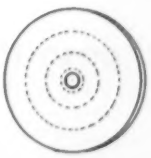
DICO BUFFS AND COMPOSITIONS FOR INDUSTRIAL ARTS USE

DICO CLOTH BUFFING WHEELS

LOOSE PLY—FULL DISC

A very flexible wheel for buffing hard-to-reach surfaces. Moderate cutting action, excellent coloring action on most materials.

	Diameter	4"	6"	8"	10"
No. 32 ¼" face	List/Doz.	$ 7.20	$10.80	$15.00	$24.00
No. 37 ½" face	List/Doz.	9.00	15.00	24.00	36.00
No. 42 ¾" face	List/Doz.	15.00	21.00	36.00	48.00



CUSHION SEWED—FULL DISC

Medium density, with good cutting and coloring action for all general purpose buffing.

		4"	6"	8"	10"
No. 31 ¼" face	List/Doz.	$ 7.20	$10.80	$15.00	$24.00
	Circles of sewing	2	2	3	3
No. 36 ½" face	List/Doz.	9.00	15.00	24.00	36.00
	Circles of sewing	2	2	3	3
No. 41 ¾" face	List/Doz.	15.00	21.00	36.00	48.00
	Circles of sewing	2	2	3	3

CANTON FLANNEL—FULL DISC

An extra soft wheel for all final coloring operations. Safest wheel to use with rouge on precious metals and plastics.

		4"	6"	8"	10"
No. 60 ½" face	List/Doz.	$ 7.20	$10.80	$16.20	$24.00
	Circles of sewing	2	2	2	3

SPIRAL SEWED—FULL DISC

Production type wheel designed for long use. Excellent for coarse buffing or flexible grinding. Sturdy ¼" spaced spiral sewing.

		4"	6"	8"	10"
No. 30 ¼" face	List/Doz.	$ 7.80	$12.00	$16.80	$27.00
No. 35 ⅜" face	List/Doz.	9.60	16.20	25.80	39.00
No. 40 ½" face	List/Doz.	16.20	22.80	38.40	51.00

BUDGET GRADE—SPIRAL SEWED

An inexpensive general purpose wheel for coarse buffing.

		4"	6"	8"	10"
No. 25 ¼" face	List/Doz.	$ 6.00	$ 9.00	$12.00	$16.20
No. 26 ⅜" face	List/Doz.	9.00	12.00	18.00	24.00
No. 27 ½" face	List/Doz.	12.00	18.00	24.00	33.00

Every Dico Buff individually boxed, with Buffing Manual and toothed flanges.

TUBE-PACKED COMPOSITIONS

Clean to handle, stays fresh, eliminates waste. Tube printed with number, type and recommended uses and instructions.

No.	Type	List Per Doz.
E5	Emery	$3.60
TC5	Tripoli	3.60
SCR	Stainless	3.60
CR1	Rouge	3.60
JR1	Jeweler's Rouge	9.00

1 dozen in a box except JR1, ½ dozen
Approximate weight per dozen, 3½ to 5 lbs.

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Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Delta Power Tool Div.
DeWalt, Inc.
Howard & Smith, Inc.
Kearney & Trecker
R. K. LeBlond Machine Tool Co.
Mico Instrument Co.
Peck, Stow & Wilcox Co.
Sears, Roebuck & Co.
South Bend Lathe Works
J. H. Williams & Co.

DIVIDERS
Alvin Co.
Berger Scientific Supplies
Brown & Sharpe Mfg. Co.
Albert Constantine & Son, Inc.
Gramercy Import Co., Inc.
Keuffel & Esser
Luftkin Rule Co.
Millers Falls Co.
Modern School Supplies
Montgomery Ward
Peck, Stow & Wilcox Co.
Frederick Post Co.
Sears, Roebuck & Co.
Stanley Tools
L. S. Starrett Co.
Upholstery Supply Co.
V & E Manufacturing Co.

DIVIDING HEADS
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Lewis Machine Tool Co.
L-W Chuck Co.

DOWEL DRILL GUIDE
"Dowl-It" Co.
Gunver Mfg. Co., Inc.
M. D. Lee Tool Co.
Upholstery Supply Co.

DOWELS
Craft Service
"Dowl-It" Co.
Kindt-Collins Co.
Frank Paxton Lumber Co.
Upholstery Supply Co.

DRAFTING EQPT.
Adjusto Eqpt. Co.
Alvin Co.
Angle Steel Inc.
Berger Scientific Supplies, Inc.
C-Thru Ruler Co.
Brodhead-Garrett Co.
Gramercy Guild Group, Inc.
Gringo Mfg. Co.
Howard & Smith
Keuffel & Esser
Lufkin Rule Co.
Mayline Co.
Modern School Supplies
Parent Metal Prods., Inc.
Frederick Post Co.
School Products Co.
Scott-Mitchell House
Stacor Equipment Co.
L. S. Starrett Co.
Stoner Wood Products Co.
Tolerton Co.
V & E Manufacturing Co.
Wessendorf, Nelms & Co.

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Alvin Co.
Keuffel & Esser Co.
Mayline Co.
Modern School Supplies
Parent Metal Products, Inc.
Frederick Post Co.
Stacor Equipment Co.
Stoner Wood Products
Tolerton Co.

DRAFTING SUPPLIES
Alvin Co.
American Lead Pencil Co.
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Eagle Pencil Co.
Gramercy Guild Group, Inc.
Higgins Ink Co., Inc.
Keuffel & Esser
Mayline Co.
Modern School Supplies
Frederick Post Co.
School Products Co.
Scott-Mitchell House
Stacor Equipment Co.
V & E Manufacturing Co.

DRILL PRESSES
Atlas Press Co.
Boice-Crane Co.
Cincinnati Lathe & Tool Co.
Delta Power Tool Division
DeWalt, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Magna Power Tool Corp.
Mico Instrument Co.
Montgomery Ward
J. A. Richards Co.
School Products Co.
Sears, Roebuck & Co.
South Bend Lathe Works
Walker-Turner

DRILLS, CARVING FOR PLASTICS
Boin Arts & Crafts Co.
D. W. Cope Plastics
Craft Service
Craftsman Supply House
Elbar Products
Foredom Electric Co.
House of Plastics
Plastic Parts & Sales
Plastic Products Co.

DRILLS, HAND
(See also Hand Tools)
Allied Radio Corp.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Craftsman Wood Service
Elbar Products Co.
Foredom Electric Co.
Howard & Smith, Inc.
Metal Crafts Supply Co.
Millers Falls Co.
Montgomery Ward
North Brothers Mfg. Co.
Peck, Stow & Wilcox Co.
Plastic Products Co.
G. A. Pratt Co.
Scott-Mitchell House
Sears, Roebuck & Co.
Stanley Tools
Upholstery Supply Co.
X-acto, Inc.

DRILLS, PORTABLE ELECTRIC
(See also Portable Electric Tools)
Allied Radio Corp.
Casting Specialties Co.
Cincinnati Tool Co.
D. W. Cope Plastics
Craft Service
Craftsman Wood Service
Howard & Smith, Inc.
Mall Tool Co.
Millers Falls Co.
Montgomery Ward
Plastic Parts & Sales
Plastic Products Co.
Proto Tools
Scott-Mitchell House
Sears, Roebuck & Co.
Stanley Electric Tools
Upholstery Supply Co.

DRILLS, TWIST
Chicago-Latrobe
D. W. Cope Plastics
Delta Power Tool
"Dowl-It" Co.
Howard & Smith, Inc.
Mall Tool Co.
Montgomery Ward
Plastic Parts & Sales
Plastic Products Co.
Scott-Mitchell House
Sears, Roebuck & Co.
Whitman & Barnes
Upholstery Supply Co.
X-acto, Inc.

DUST COLLECTORS
Aget Mfg. Co.
American Air Filter Co.
Craftools, Inc.
Kindt-Collins Co.

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(See also Radio Eqpt.)
Allied Radio Corp.
Angelo Bros.
Burstein-Applebee
Crow Electri-Craft
Dumville Inst. Co.
Electronic Inst. Co.
Gearon Co.
Gyro Lamp & Shade Corp.
L. H. Kassell & Co.
Montgomery Ward
Ohmite Mfg. Co.
Parent Metal Products, Inc.
Patterson Brothers
Rylan Electronic Corp.
Science Electronics
Standard Electric Time Co.
Telephone Engineering Co.
Tolerton Co.

ELECTRIC MOTORS
(See Motors)

ELECTRONIC EQPT.
Allied Radio Corp.
Burstein-Applebee
Crow Electri-Craft
Dumville Instrument Co.
Electronic Instrument Co.
Heath Company
Ohmite Mfg. Co.
Rylan Electronic Corp.
Science Electronics
Standard Electric Time Co.

ENAMELING SUPPLIES, AND EQUIPMENT
Boin Arts & Crafts Co.
Burgess Vibrocrafters, Inc.
Craftools, Inc.
Craft Service
Dearborn Leather Co.
Eastern Handicraft Supply Co.
The Copper Shop
Gagers Handicraft
Ernest Linick & Co.
Plasticast Co.
Sax Brothers, Inc.
School Products Co.
Seeley's Ceramic Service
Tepping Studio Supply
Thomas C. Thompson Co.
Western Materials Co.

EXTENSIONS, TAP
Walton Co.

EXTRACTORS, PIPE, STUD, SCREW
Walton Co.

EXTRACTORS, TAP
Walton Co.

FIBERGLASS
(See Plastics)

FILES, HAND
Craftsman Supply House
Howard & Smith, Inc.
Metal Crafts Supply Co.
Frank Mittermeier
Montgomery Ward
Fayette R. Plumb
Proto Tools
Sears, Roebuck & Co.
Severance Tool Ind., Inc.
X-acto, Inc.
Upholstery Supply Co.

FILES, ROTARY
Frank Mittermeier
Severance Tool Ind., Inc.

FILING MACHINES
Boice-Crane Co.
Foley Mfg. Co.
Howard & Smith, Inc.
Sales Service Machine Tool Co.

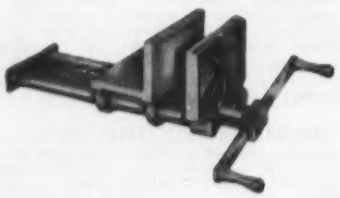
FINDINGS METAL
Boin Arts & Crafts Co.
D. W. Cope Plastics
Craft Service
House of Plastics
Plasticast Co.
Plastic Parts & Sales
Plastic Products Co.
Sax Brothers, Inc.
School Products Co.
Tepping Studio Supply

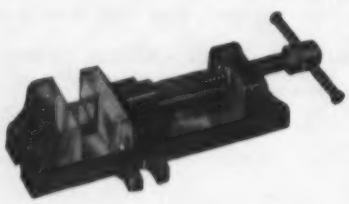
FLEXIBLE SHAFT MACHINES
Boin Arts & Crafts Co.
D. W. Cope Plastics
Dremel Mfg. Co.
Foredom Electric Co.
House of Plastics
Mall Tool Co.
Montgomery Ward
Plastic Parts & Sales
Plastic Prods. Co.
Sears, Roebuck & Co.
Walker-Turner

FORGE, GAS FIRED
McEnglevan Heat Treat. & Mfg. Co.

FORGE TOOLS
Cincinnati Tool Co.
Howard & Smith, Inc.
Millers Falls Co.

machinists vise


woodworkers' vise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utility vise

choose these quality vises for every shop need

You can standardize on Desmond-Simplex vises for every department with the knowledge that any of the 44 vises in the line will stand hard use. Desmond-Simplex vises cost no more, yet provide outstanding advantages which set them apart from others.

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Three sizes of drill press vises available for all requirements. Utility vises have integral or removable pipe jaws. Send for a copy of our complete vise catalog and name of your nearest distributor. Standardize on quality on your next vise requisition.

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FOR THE MODERN SCHOOL SHOP

NO. 10 HOLLOW CHISEL MORTISER

The POWERMATIC No. 10 is fast becoming the most popular Hollow Chisel Mortiser in the Modern School Shop. The "MAGIC" action of the sliding head forever banishes the sticking, jumping and pounding common in most hollow chisel Mortisers.

Extremely heavy in construction and designed for production work; this precision made machine is priced well within the budget of the School and small cabinet shop.

The compound table permits operator to mortise at any angle, while the rack on the table enables successive cuts in a straight line without unclamping the work. Write for complete information.

PRICED COMPLETE with 1 HP motor.....$515.00

Also Manufacturers of 12", 16", 20" & 24" Planers, Chain Saw Mortisers and Single End Tenoners.

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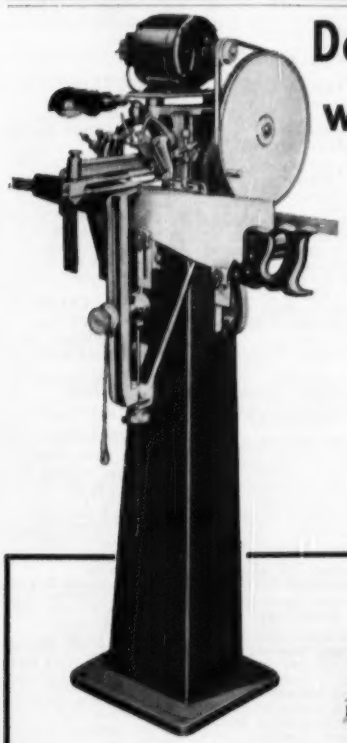

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Train your students to use Foley machines. They will do better work with Foley sharpened saws. Foley equipment is safe to operate and is widely used by hundreds of schools, colleges, industries, Army, Navy, Air Force, etc.

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You can sharpen 4 to 6 hand saws per hour with these three Foley Automatic power machines—Retoother, Saw Filer, Setter.

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Foley Saw Sharpening Machines have proven their value for making physically handicapped persons self-supporting in their own business. Write us for full details.

30-DAY FREE TRIAL

Any Foley machine may be installed on 30-day FREE TRIAL. Write today for detailed information.

FOLEY MANUFACTURING CO.

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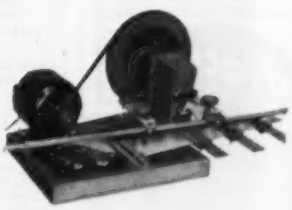
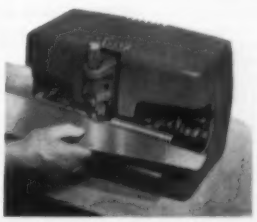
Files hand, band and cross-cut circular saws with machine accuracy. The saw is clamped in carrier which feeds it through all 3 machines for retoothing, filing, setting.



FOLEY RETOOTHER

Cuts new teeth in old saws (either straight or crowned edge) in one run through machine.



FOLEY SETTER

For both hand and band saws. Sets teeth on both sides in ONE run with perfect machine accuracy.

NEW FOLEY GRINDER

Low cost Foley 314 Grinder sharpens circular saws up to 44" diam.; also dado heads, rotary power lawn mower blades, scissors, sharp edged tools. Sands, buffs, polishes.

Scott-Mitchell House
Stanley Tools

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Delta Power Tool Div.
DeWalt, Inc.
Howard & Smith, Inc.
M. Englevan Heat Treating & Mfg. Co.
Patterson Bros.
Tularton Co.
Western Materials Co.

FURNACES, SHOP
Electric Hotpack Co., Inc.
Howard & Smith, Inc.
McEnglevan Heat Treating & Mfg. Co.
Western Materials Co.

GAGES, METALWORKING
Brown & Sharpe Mfg. Co.
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Sax Brothers Co.

Geo. Scherr Co.
Sears, Roebuck & Co.
L. S. Starrett Co.

GAGES, WOODWORKING
Alvin Co.
Craftsman Wood Service
Howard & Smith, Inc.
Lufkin Rule Co.
Magna-Set Co.
Millers Falls Co.
Stanley Tools
L. S. Starrett Co.

GLUE POTS
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Electric Hotpack Co.
Howard & Smith, Inc.
Kindt-Collins Co.
Oliver Machinery Co.
Upholstery Supply Co.

GLUES, CEMENTS
Boin Arts & Crafts Co.
Borden Co.

Brodhead-Garrett Co.
Cadillac Plastic Co.
D. W. Cope Plastics
Craft Service
Craftsmen Wood Service
DonJer Products Co.
Giles & Kendall Co.
Higgins Ink Co.
Howard & Smith, Inc.
Kindt-Collins Co.
M. D. Lee Tool Co.
Leisure Crafts
Minnesota Woodworkers Supply Co.
Modern School Supplies
Frank Paxton Lumber Co.
Plasticast Co.
Plastic Parts & Sales
Plastic Products Co.
Frederick Post Co.
Rogers Isinglass & Glue Co.
Sax Brothers Co.
School Abrasives
Upholstery Supply Co.
U. S. Plywood Corp.

GRINDERS, CENTERLESS
Cincinnati Milling Machine Co.

GRINDERS, PORTABLE ELECTRIC
J. G. Blount Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
D. W. Cope, Plastics
Craft Service
Foredom Electric Co.
Dremel Mfg. Co.
Mall Tool Co.
Millers Falls Co.
Montgomery Ward
Plastic Parts & Sales
Plastic Products
Stanley Electric Tools
Upholstery Supply Co.

GRINDERS, PRODUCTION, SURFACE
Brown & Sharpe
Cincinnati Milling Machine Co.

Covel Mfg. Co.
Delta Power Tool

GRINDERS, TOOL
(See also Grinders, Portable; Grinders, Toolpost)
Atlas Press Co.
J. G. Blount Co.
Boice-Crane Co.
Brown & Sharpe
Cincinnati Milling Machine Co.
Craftools, Inc.
Craftsman Wood Service
Delta Power Tool Division
DeWalt, Inc.
Howard & Smith, Inc.
Kearney & Trecker
R. K. LeBlond Machine Tool Co.
Mico Instrument Co.
Millers Falls Co.
Oliver Machinery Co.
Queen City Machine Tool Co.
School Abrasives
Sears, Roebuck & Co.
South Bend Lathe Works
Stanley Tools
Upholstery Supply Co.
Walker-Turner

GRINDERS, TOOLPOST
Atlas Press Co.
Montgomery Ward
South Bend Lathe Works
Stanley Tools

HACKSAWS, HAND
(See also Hand Tools)
Allied Radio Corp.
Brodhead-Garrett Co.
Duro Metal Products Co.
Howard & Smith, Inc.
M. D. Lee Tool Co.
Leisure Crafts
Millers Falls Co.
Montgomery Ward
Peck, Stow & Wilcox Co.
G. A. Pratt Co.
Proto Tools
Sears, Roebuck Co.
L. S. Starrett Co.
Upholstery Supply Co.

HACKSAWS, POWER
Howard & Smith, Inc.
Lewis Machine Tool Co.
L-W Chuck Co.
Millers Falls Co.
Montgomery Ward
G. A. Pratt Co.
Sales Service & Machine Tool
Sears, Roebuck & Co.
L. S. Starrett Co.

HAMMERS, METALWORKING
Billings & Spencer Co.
Casting Specialties Co.
Albert Constantine & Son, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Metal Crafts Supply
Peck, Stow & Wilcox Co.
Fayette R. Plumb
Proto Tools
Sax Brothers Co.
Sears, Roebuck & Co.
Stanley Tools
J. H. Williams & Co.

HAMMERS, WOODWORKING
Albert Constantine & Son, Inc.
Craftsman Wood Service
Howard & Smith, Inc.
M. D. Lee Tool Co.
Peck, Stow & Wilcox Co.
Fayette R. Plumb
Sears, Roebuck & Co.
Stanley Tools
Upholstery Supply Co.

HAND TOOLS, MACHINE SHOP
(See also Hand Tools, Mechanics)
Allied Radio Corp.
Armstrong Brothers Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Casting Specialties Co.
Cincinnati Tool Co.
Duro Metals Prods. Co.
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Montgomery Ward
North Bros. Mfg. Co.
Peck, Stow & Wilcox Co.
Proto Tools
Geo. Scherr Co.
Sears, Roebuck & Co.
Stanley Tools
L. S. Starrett Co.
J. H. Williams & Co.

HAND TOOLS, MECHANICS
Allied Radio Corp.
Armstrong Bros. Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Tool Co.
Albert Constantine & Son, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Imperial Brass Mfg. Co.
Irwin Auger Bit Co.
Lufkin Rule Co.
Millers Falls Co.
Montgomery Ward
North Bros. Mfg. Co.
Fayette R. Plumb
Proto Tools
Sax Brothers, Inc.
Geo. Scherr Co.
Scott-Mitchell House
Sears, Roebuck & Co.
Stanley Tools
L. S. Starrett Co.
J. H. Williams & Co.
X-acto, Inc.

HAND TOOLS, WOODWORKING
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service
Eastern Handicraft Supply Co.
Greenlee Tool Co.
Gunver Mfg. Co.
Howard & Smith, Inc.
Irwin Auger Bit Co.
M. D. Lee Tool Co.
Leisure Crafts
Millers Falls Co.
Frank Mittermeier
Montgomery Ward
North Bros. Mfg. Co.
Peck, Stow & Wilcox Co.
Fayette R. Plumb
Price & Rutzebeck
Red Devil Tools
Sax Brothers, Inc.
Scott-Mitchell House
Sears, Roebuck & Co.
Stanley Tools
L. S. Starrett Co.
X-acto, Inc.
Upholstery Supply Co.

HARDWARE SUPPLIES
Allied Radio Corp.
Brodhead-Garrett Co.
Craftsman Wood Service
Gearon Co.
Lufkin Rule Co.
Millers Falls Co.
Minnesota Woodworkers Supply Co.
Frank Mittermeier
Montgomery Ward
Scott-Mitchell House
Sears, Roebuck & Co.
Upholstery Supply Co.

HOISTS, CRANES
Howard & Smith, Inc.
Montgomery Ward
Sears, Roebuck & Co.

JEWELRY TOOLS, SUPPLIES
Jewelry Craft Supply

JIG SAWS
(See Saws, Jig)

KNIVES, SLOYD, CRAFT
Boin Arts & Craft Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craft Service
Craftsman Wood Service
Eastern Handicraft Supply Co.
Gearon Co.
Howard & Smith, Inc.
Leisure Crafts
Lufkin Rule Co.
Frank Mittermeier
Robert Murphy Co.
Sax Brothers, Inc.
Stanley Tools
X-acto, Inc.

LAMP PARTS
Gyro Lamp & Shade Corp.
L. H. Kassel & Co.

LAPIDARY SUPPLIES
Craftools
School Abrasives

For Addresses of Firs See List Starting on Page 88

new "package deals" on machinery for your shop!
Deal No. 1 $129500 delivered
Deal No. 2 $96500 delivered
Deal No. 3 $73500 delivered

Three new "package deals" of Di-Acro Precision Machines are now offered to *school shops only* at a new low price! Brake and Roller are Spartan models, designed especially for schools. Bender, Notcher and Shear are industry proven. Benches of heavy gauge steel are designed for efficiency and long wear. Special prices include freight to your school.

Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Notcher
Di-Acro Bender No. 2

Bender Accessory Package
Bender Stand
Machinery Stand

Reg. prices add up to $1427.00 plus freight.

Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4

Di-Acro Bender No. 1A
Bender Accessory Package
Machinery Stand

Reg. prices add up to $1055.50 plus freight.

Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Bender No. 2

Bender Accessory Package
Bender Stand
Machinery Stand

Reg. prices add up to $832.00 plus freight.

All Di-Acro products are backed by one year's warranty.

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di-acro PRECISION METALWORKING MACHINES

Tell me about
- Package Deal No. 1
- Package Deal No. 2
- Package Deal No. 3

O'NEIL-IRWIN MFG. CO.
385 8th Ave., Lake City, Minn.

Name_____
School_____
Address_____

LATHES, ENGINE

Atlas Press Co.
Cincinnati Lathe & Tool Co.
Delta Power Tool Division
Howard & Smith, Inc.
R. K. LeBlond Machine Tool Co.
Logan Engineering Co.
Montgomery Ward
Sheldon Machine Co.
South Bend Lathe Works

LATHES, METALSPINNING

J. G. Blount Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Power Tool Div.
Montgomery Ward
Oliver Machinery Co.
Plasticast Co.
Sears, Roebuck & Co.
Sheldon Machine Co.

LATHES, TURRET
(Includes Screw Machines)

Atlas Press Co.
Brown & Sharpe Mfg. Co.
Howard & Smith Inc.
Logan Engineering Co.
Montgomery Ward
Sheldon Machine Co.
South Bend Lathe Works

LATHES, WOODWORKING

Atlas Press Co.
J. G. Blount Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Power Tool Division
DeWalt, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Kindt-Collins Co.
Magna Power Tool Corp.
Montgomery Ward
Oliver Machinery Corp.
School Products Co.
Sears, Roebuck & Co.
Walker-Turner Div.
Yates-American Machine Co.

LEATHERCRAFT, TOOL AND SUPPLIES

Boin Arts & Crafts
Burgess Vibrocrafters, Inc.
Craft Service
Craftsman Supply House
Dearborn Leather Co.
Eastern Handicraft Supply Co.
Gagers Handicrafts
Robt. J. Golka Co.
J. C. Larson Co.
Leisure Crafts
Osborn Bros. Supply Co.
Plasticast Co.
S & S Leather Co.
Sax Brothers, Inc.
Tandy Leather Co.
X-acto, Inc.

LEVELS

Berger Scientific Supplies
Columbian Vise & Mfg. Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Montgomery Ward
Peck, Stow & Wilcox Co.
Sears, Roebuck & Co.
South Bend Lathe Works
Stanley Tools
L. S. Starrett Co.
Upholstery Supply Co.

LUMBER
(See also Woodshop Supplies)

Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Cotton-Hanlon
Craftsman Wood Service Co.
T. A. Foley Lumber Co.
Giles & Kendall Co.
Hardwood Corp. of America
Kindt-Collins Co.
Minnesota Woodworkers Supply Co.
Frank Paxton Lumber Co.

MACHINE SHOP EQPT. & SUPPLIES

Abernathy Vise & Tool Co.
Armstrong Brothers Tool Co.
Berkroy Products, Inc.
Boice-Crane Co.
Boyar-Schultz Corp.
Brodhead-Garrett Co.
Brown & Sharpe
Casting Specialties Co.
Cerro de Pasco Corp.
Challenge Machinery Co.
Cincinnati Lathe & Tool Co.
Cincinnati Milling Machine Co.
Delta Power Tool Div.
Greaves Mach. Tool Co.
Howard & Smith, Inc.
Kearney & Trecker
R. K. LeBlond Machine Tool Co.
Lewis Machine Tool Co.
Logan Engineering Co.
Lufkin Rule Co.
Mico Instrument Co.
Millers Falls Co.
Parent Metal Prods. Inc.
Patterson Bros.
J. A. Richards Co.
School Products Co.
Sears, Roebuck & Co.
Sheldon Machine Co.
South Bend Lathe Works
Tolerton Co.
Walker-Turner Div.
Wells Mfg. Corp.
Wilton Tool Mfg. Co.

MACHINE TOOL ATTACHMENTS

Armstrong Brothers Tool Co.
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Lathe & Tool Co.
Cincinnati Milling Machine Co.
Delta Power Tool Div.
Greaves Mach. Tool Co.
Howard & Smith, Inc.
Kearney & Trecker
R. K. LeBlond Machine Tool Co.
Logan Engineering Co.
L-W Chuck Co.
Sheldon Machine Co.
South Bend Lathe Works
U. S. Burke Machine Tool Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.

MACHINE TOOLS, WOOD AND METAL
(See machine wanted)

MEASURING TOOLS, PRECISION
(See also tool wanted)

Alvin Co.
Brodhead-Garrett Co.
Brown & Sharpe
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Modern School Supplies
Montgomery Ward
Geo. Scherr Co.
Sears, Roebuck & Co.
L. S. Starrett Co.
P. A. Sturtevant Co.

MECHANICAL DRAWING
(See Drafting)

MELTING POTS

Howard & Smith, Inc.
McEnglevan Heat Treating & Mfg. Co.
Sears, Roebuck & Co.
Western Materials

METALWORKING SUPPLIES

Berkroy Products, Inc.
Boin Arts & Crafts Co.
Brodhead-Garrett Co.
Cerro de Pasco Corp.
Cincinnati Tool Co.
Craft Service
Craftsman Supply House
Dearborn Leather Co.
DonJer Products Co.
Howard & Smith, Inc.
J. C. Larson Co.
Metal Crafts Supply Co.
Metal Goods Corp.
Montgomery Ward
Patterson Bros.
Peck, Stow & Wilcox Co.
Pootatuck Corp.
Reynolds Metals Co.
Sax Brothers, Inc.
Sears, Roebuck & Co.
Southern Screw Co.

MICROMETER CALIPERS

Alvin Co.
Brown & Sharpe Co.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Lufkin Rule Co.
Millers Falls Co.
Geo. Scherr Co.
Sears, Roebuck & Co.
L. S. Starrett Co.

MIDGET MILLS

Severance Tool Ind., Inc.

MILLING MACHINES

Atlas Press Co.
Brown & Sharpe Co.
Cincinnati Milling Machine Co.
Greaves Machine Tool Co.
Howard & Smith, Inc.
Kearney & Trecker
Lewis Mach. Tool Co.
L-W Chuck Co.
Logan Eng. Co.
Sheldon Machine Co.
South Bend Lathe Works
U. S. Burke Machine Tool Co.

MORTISERS, WOODWORKING

Boice Crane Co.
Delta Power Tool Division
DeWalt, Inc
Greenlee Bros. & Co.
Howard & Smith, Inc.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Powermatic Machine Co.
South Bend Lathe Works
Stanley Electric Tools
Yates American Machine Co.

MOTORS, ELECTRIC

Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Crow Electri-Craft Corp.
Delta Power Tool Division
DeWalt, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Haster Appliance Mfg. Co.
Montgomery Ward
Rylan Electronic Corp.
Sears, Roebuck & Co.
South Bend Lathe Works
Walker-Turner Division

MUSIC BOX MOVEMENTS

Craftsman Supply House
Plastic Products Co.
School Products Co.

OVENS, PLASTIC PREHEATING

D. W. Cope Plastics
Electric Hotpack Co., Inc.
Howard & Smith
Plasticast Co.
Western Materials

PAINT BRUSH CONDITIONER

Wisconsin Laboratories, Inc.

PAINTING EQPT., SPRAY

Brodhead-Garrett Co.
Burgess Vibrocrafters, Inc.
Albert Constantine & Son, Inc.
Craftsman Wood Service
Howard & Smith, Inc.
Montgomery Ward
Paasche Airbrush Company
Tepping Studio Supply Co.

PAINTS, FINISHES

Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Desmond Bros. Paint Co.
DonJer Products Co.
Eastern Handicraft Supply Co.

Addresses of Firms Start on Page 88

STRETCH FORM
BLOW FORM
VACUUM FORM

DI-ACRO PLASTICS PRESS
brings the techniques of the plastics industry into the school shop

MATERIALS AVAILABLE AT LOW COST

A variety of colors are available in 18" x 24" sheets of both acrylic and styrene plastics in many thicknesses.

PROJECTS ARE AVAILABLE, TOO

Plastics for the School Shop—twelve new plastics projects—have been published to stimulate thinking in blow, vacuum and stretch forming.

Di-Acro Plastic Press No. 18 is a three way press that will professionally execute hundreds of new plastics projects. It stretch forms pre-heated plastics over student made wood or plaster plugs. It blow and vacuum forms by motor driven pump into easy-to-fashion molds. Handles sheets up to 18" x 18".

Di-Acro Plastic Press No. 1 stretch forms only, but can easily be converted to blow forming. Other features same as No. 18.

All Di-Acro products are backed by one year warranty

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di-acro PRECISION METALWORKING MACHINES

PLEASE SEND
- ☐ Plastics Press Literature
- ☐ Plastics Price Sheets
- ☐ Plastics for the School Shop

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355 Eighth Ave. • Lake City, Minn.

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School_____
Address_____

General Finishes Sales & Service
Howard & Smith
Leisure Crafts
Plasticast Co.
U. S. Plywood Corp.
Upholstery Supply Co.

PENCILS, LEADS, AND ERASERS

Alvin Co.
American Lead Pencil Co.
Berger Scientific Supplies, Inc.
Boin Arts & Crafts Co.
Eagle Pencil Co.
Leisure Crafts
Modern School Supplies
Frederick Post Co.

PENS, DRAWING
(See Drafting Eqpt.)

PENS, FOUNTAIN

Alvin Co.
D. W. Cope Plastics
Craftsman Supply House
Gilbert & Miller

House of Plastics
Plastic Products Co.
School Abrasives
School Products Co.

PLANERS & JOINTERS, WOODWORKING

Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Delta Power Tool Division DeWalt, Inc.
Duro Metal Products Co.
Greenlee Bros. & Co.
Howard & Smith, Inc
M. D. Lee Tool Co.
Lewis Machine Tool Co.
Magna Power Tool Corp.
Montgomery Ward
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Parks Woodworking Machine Co.
Powermatic Machine Co.
Sears, Roebuck & Co.

Stanley Tools
Walker-Turner Division
Woodworkers Tool Works
Yates-American Machine Co.

PLANES, HAND

Albert Constantine & Son, Inc.
Craftsman Wood Service
Howard & Smith, Inc.
Millers Falls Co.
Montgomery Ward
Peck, Stow & Wilcox Co.
Sears, Roebuck & Co.
Stanley Tools
Upholstery Supply Co.
X-acto, Inc.

PLASTIC FORMING MACHINES

O'Neil-Irwin Mfg. Co.

PLASTICS, DYES FOR

Boin Arts & Crafts Co.
Cadillac Plastic Co.
Castolite Co.
D. W. Cope Plastics
Craftsman Supply House
House of Plastics
Plasticast Co.
Plastic Parts & Sales
Plastic Products Co.
School Products Co.

PLASTICS & SUPPLIES

Boin Arts & Crafts
Brodhead-Garrett Co.
Cadillac Plastic Co.
Castolite Co.
Commercial Plastics & Supply Co.
Albert Constantine & Son, Inc.
D. W. Cope Plastics
Craft Service
Craftsman Supply House
DonJer Products Co.
Electric Hotpack Co.,
Fry Plastics Co.
Gagers Handicraft
General Binding Corp.
House of Plastics
Howard & Smith, Inc.
Frank Paxton Lumber Co.
Plasticast Co.

Plastic Parts & Sales
Plastic Products Co.
School Products Co.
Zenith Plastics Co.

PLIERS

Allied Radio Corp.
Billings & Spencer Co.
Craft Service
Duro Metal Prods. Co.
Montgomery Ward
Peck, Stow & Wilcox
Proto Tools
Sax Brothers, Inc.
Scott-Mitchell House
Sears, Roebuck & Co.
Upholstery Supply Co.
J. H. Williams & Co.

PLYWOOD

Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service Co.
Douglas Fir Plywood
Hardwood Corp. of America
Minnesota Woodworkers Supply Co.
Frank Paxton Lumber Co.
U. S. Plywood Corp.

PORTABLE ELECTRIC TOOLS
(See also tool wanted)

Allied Radio Corp.
Brodhead-Garrett Co.
Burgess Vibrocrafters, Inc.
D. W. Cope Plastics
Craft Service
DeWalt, Inc.
Dremel Mfg. Co
Howard & Smith, Inc.
Mall Tool Co.
Master Appliance Mfg. Co.
Millers Falls Co.
Montgomery Ward
Plasticast Co.
Plastic Products Co.
Price & Rutzebeck
Scott-Mitchell House
Sears, Roebuck & Co.
Stanley Electric Tools
Syncro Corp.
Upholstery Supply Co.

PRECISION EQUIPMENT
(See also Measuring Tools)

Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Challenge Machinery Co.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Lufkin Rule Co.
Mico Instrument Co.
Millers Falls Co.
Plasticast Co.
Scott-Mitchell House
L. S. Starrett Co.
P. A. Sturtevant Co.

PRESSES, ARBOR

Castino Specialties Co.
Dake Corp.
Howard & Smith, Inc.

PRESSES, POWER PUNCH

Sales Service Machine Tool Co.

PRESSES, PRINTING

Challenge Machinery Co.
Chandler & Price Co.

PRINTING EQPT. AND TYPES

Berkroy Products
Challenge Machinery Co.
Chandler & Price Co.
General Binding Corp.
Howard & Smith
J. A. Richards Co.

PUBLISHERS

American Technical Society
Arco Publishing Co.
Theodore Audel & Co.
Chas. A. Bennett Co., Inc.
Craft Service
Delmar Publishers, Inc.
Dodd, Mead Co.
Eastern Handicraft Supply Co.
Goodheart-Wilcox Co.
Harper & Bros.
Home Craftsman Publishing Co.
Lincoln Electric Co.
Macmillan Co.
Master Technical Press
McGraw-Hill Book Co.
McKnight & McKnight Publishers
Motor Book Dept.
Pitman Publishing Co.
Popular Mechanics Press
Prentice-Hall, Inc.
Charles Quinlan
John E. Rider, Publisher
Howard W. Sams & Co.
Steck Co.
D. Van Nostrand Co.
John Wiley & Sons

PUNCHES

Billings & Spencer Co.
Cincinnati Tool Co.
General Binding Corp.
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
O'Neil-Irwin Mfg. Co.
Peck, Stow & Wilcox Co.
Proto Tools
Stanley Tools
L. S. Starrett Co.
J. H. Williams & Co.
X-acto, Inc.

RADIO EQPT. AND SUPPLIES

Allied Radio Corp.
Crow Electri-Craft Corp.
Howard W. Sams & Co., Inc.
Ohmite Manufacturing Co.
Rylan Electronic Corp.

SCIENCE ELECTRONICS

REAMERS

Brodhead-Garrett Co.
Howard & Smith, Inc.
Sears, Roebuck & Co.
Whitman & Barnes

ROUTERS, WOODWORKING

Boice-Crane Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service Co.
Delta Power Tool Division DeWalt, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Kindt-Collins Co.
Mall Tool Co.
Montgomery Ward
Price & Rutzebeck
J. A. Richards Co.
Sears, Roebuck & Co.
Stanley Electric Tools
Upholstery Supply Co.
X-acto, Inc.

RUBBER STAMP MAKING EQPT.

Berkroy Products
G. A. Pratt Co.

RULES, MEASURING

Alvin Co.
Berger Scientific Supplies, Inc.
Brown & Sharpe Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service
C-Thru Ruler Co.
Evans Rule Co.
Howard & Smith, Inc.
Keuffel & Esser
Lufkin Rule Co.
Millers Falls Co.
Modern School Supplies
Montgomery Ward
Frederick Post Co.
Sears, Roebuck & Co.
Stanley Tools
L. S. Starrett Co.
Upholstery Supply Co.

SAFETY EQUIPMENT

Brett-Guard Company
Brodhead-Garrett Co.
Dow Corning Corp.
Howard & Smith, Inc.
Mall Tool Co.
Stanley Electric Tools

SANDERS AND SURFACERS
(Includes belt, disc, spindle and portable)

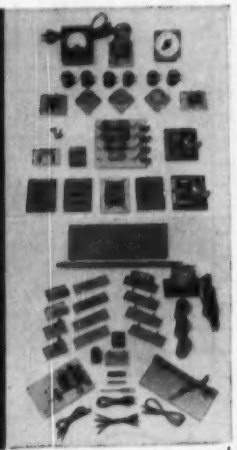
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.

For Addresses of Firms See List Starting on Page 88

Introducing a Practical New CROW *"Visual Experiment"* Kit

ELECTRONIC TUBES, CIRCUITS & DEVICES Model 53

Easy to Teach... Exciting to Learn



65 Related Experiments Permit Construction of

- Magnetic Amplifiers
- Photo-Electric Controls
- Audio Amplifier Circuits
- RF Inductance and Capacitance
- Audio Oscillators
- AM and FM Receivers
- Multi Vibrators
- Electronic Counting Circuits
- Flip-Flop Circuits
- ... and many more

The Crow Electri-Kit for Beginners and the Crow Basic Electronics Kit have brought electricity and electronics into thousands of schools . . . schools where these subjects were long considered too difficult or too expensive to teach.

Now Crow brings you Model 53—a unique *Advanced Electronics* kit. This "learn-by-doing" kit gives your students penetrating insight into the fascinating world of Radio Transmitting and Receiving, Industrial Electronic Controls, Electron Tube Theory, and Basic Radar and TV.

With the kit's 108 components, students *build their own operating assemblies.* A correlated, 600-page work manual gives complete directions for assembly plus historical background and practical applications of each experiment. Written in simple language using only elementary mathematics, the manual permits teachers with limited technical training to teach the course easily.

Model 53 is the comprehensive, common-sense way to practical electronic knowledge, yet its cost is remarkably low. The complete kit as shown above—*nothing else to buy*—costs only $193.75. *Write for illustrated folder.*

CROW ELECTRI-CRAFT CORPORATION

Division of Universal Scientific Co., Inc. • Box 336R • Vincennes, Indiana

Kindt-Collins MASTER Products for use in Vocational Training Schools

Since 1914, we have specialized in the design, manufacture and sale of a wide range of products especially adapted for use in vocational and trade schools. These products have long been tested, approved and preferred for use in commercial pattern shops, foundries, woodworking, plastics, and many other industries.

Corisa, the quality pattern lumber that stays straight. Ideal for the pattern shop or woodworking class. Easy to carve, beautiful appearance, more useable lumber per dollar.

Master 24" and 30" Disc Grinders and Sanders.

Master Spindle Sander.

Models 550 & 1050 Master Dust Collectors—ideal for small shops and individual machines.

Ventomatic Air Control Valves—for improving the efficiency of Dust Collectors and Dust Systems.

Master Brass Dowels for wood.

Master White Glue—a superior cold-type liquid glue.

Master Fillets—Wax, Leather, Wood and Plastic.

Master Sheet Waxes—for use in plastic arts.

Master Aluminum Melting Furnaces—50 and 100 lb. capacities.

Master Pattern and Table Letters.

A Wide Range of Other Products.

Write for details, prices, etc., on any particular items you are interested in. A free catalog is available on request, if you will write on your school stationery stating your position.

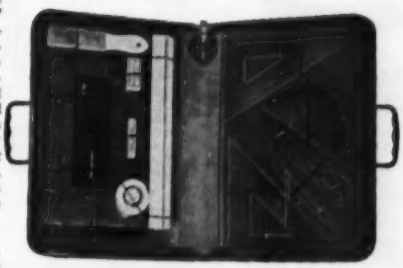
THE KINDT-COLLINS COMPANY

12651 ELMWOOD AVENUE • CLEVELAND 11, OHIO

Have you met the teachers' pet? BERGER all-in-one drafting kits

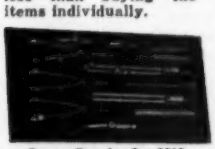
Berger Drafting Kits are at the "head of the class" with instructors everywhere. And with students, too. With the Berger Drafting Kit, students are fully-equipped with every tool they need ... every day. Sessions get under way promptly without students begging the loan of a protractor, a triangle, a scale. It's today's indispensable teaching aid.

Tell your students about the Berger Kit — costs less than buying the items individually.



Pat. Pend.

Recommended and used in hundreds of schools.



Berger Drawing Set "510

Complete — high-grade scholastic set; in velvet lined case. Price including complete kit—$11.00.

T-710A With interchangeable nickel silver master bow—$9.40.

Prices quoted are for quantities of 6 or more kits. Instructors may buy sample kit at same low price.

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Protractor	French Curve
Architect's Scale	Draftsman's Tape
Engineer's Scale	Pencil Pointer
8" Triangle	2 Drawing Pencils
10" Triangle	2 Erasers

Inner compartments hold drawing and note papers—all in attractive, durable 16" x 24" simulated leather 3-way zippered carrying case of scuff-proof, waterproof Texon with slide-in type handles.

Write for literature and complete prices.

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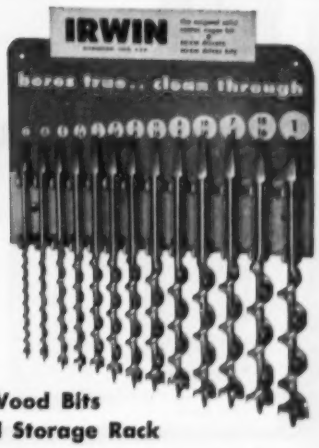
MATERIALS AND EQUIPMENT FOR ENGINEERS, ARCHITECTS, SURVEYORS AND DRAFTSMEN

IRWIN School Shop Special



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SIZES ¼ to 1"

Set of 13 Irwin Wood Bits and colorful Metal Storage Rack

This new Irwin bit set and rack helps keep tools in place, teaches neatness in your shop. Assignments will be completed quicker, too. Irwin solid center bits cut clean, fast, accurate. Each Irwin bit hardened full length to stay sharp longer. Durable steel rack screws on wall or bench. Patented spring-steel clips hold bits firmly in place. Size markings on rack for easy selection. Quantity limited — so see your independent hardware dealer soon.

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IRWIN Wilmington, Ohio — the original solid center auger bit • screw drivers screw driver bits

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(See Lathes, Turret)

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For Addresses of Firms See List Starting on Page 88

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14" swing, 1" collet
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The school shop equipped with Logan Lathes gives its students the big advantage of learning on an actual industrial tool. Logan sustained accuracy and versatility permits a broad range of industrial type projects for advanced classes. Logan safe-operation features and rugged construction are of special value with novice groups. No other lathes of comparable specifications match these Logans for economy.

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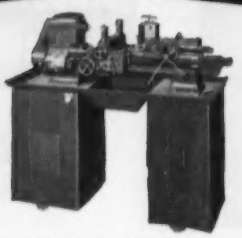

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The Brett-Guard multi-purpose circular-saw safety fixture brings a measure of safety to your shop that you never dreamed possible.

The Brett-Guard and Guide (at right) attached to a circular saw. Note the sturdy, transparent plexiglas construction.

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. . . "see and saw at all times" . . .

- Plastic construction allows complete vision of the job.
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The guard and guide eliminates "C" clamps spring hold-ins and hold-downs for horizontal pressure.

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Addresses of Firms Start on Page 88

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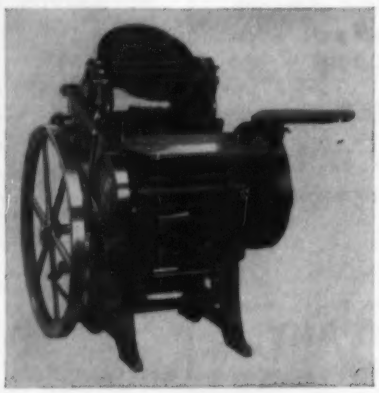

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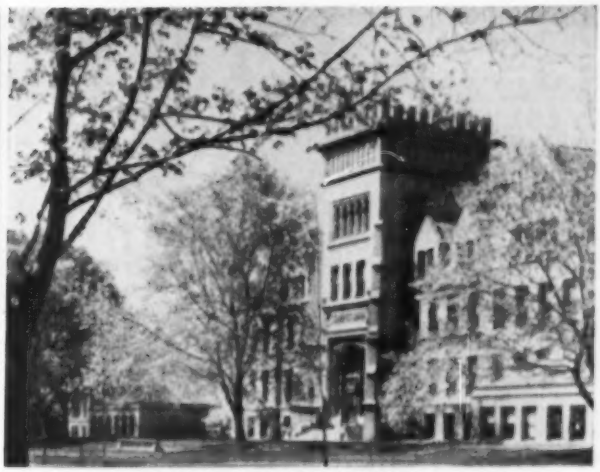

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Howard & Smith, Inc.
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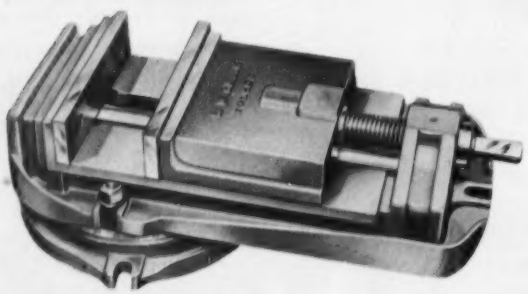

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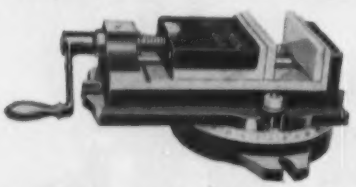

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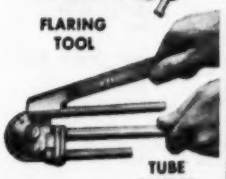
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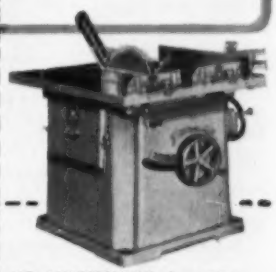

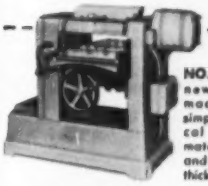

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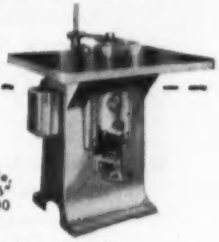

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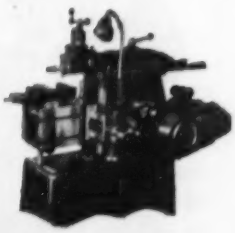

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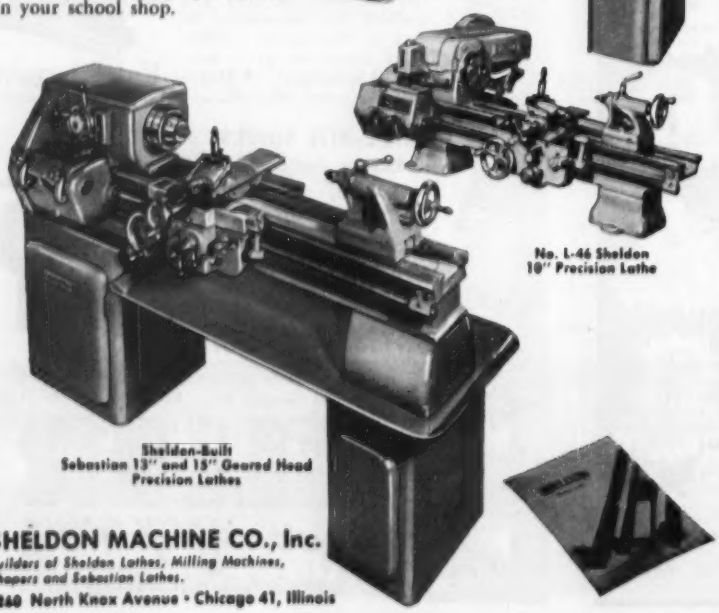

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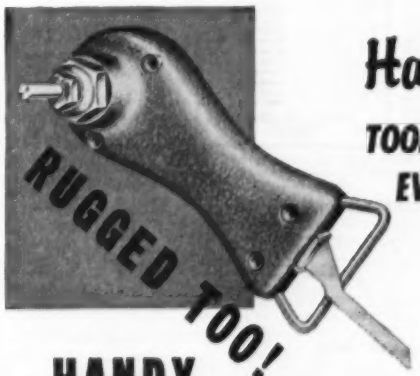

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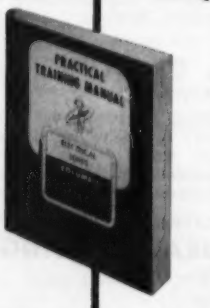

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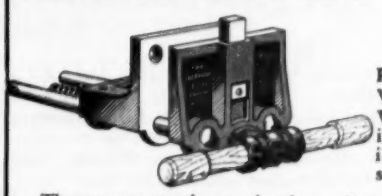

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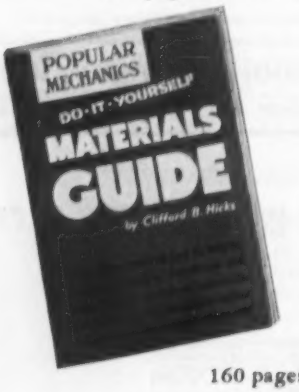

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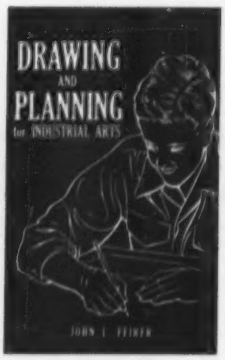

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Books:

Fundamentals of Machine Shop Practice. Stieri. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1956. Pp. vii+322. $5.00.

All of the fundamental operations carried on in a machine shop are presented in this book. The text is couched in nontechnical language and is illustrated by many excellent pictures.

In view of the growing interest in metal spinning the chapter on this subject is especially valuable.

Another unusual feature of the book appears in the "Rapid Review" that appears at the end of each chapter. These reviews should serve to guide the teacher in stressing the important points in each lesson, and they should be an aid to the pupil in making him aware of the significant things he is expected to learn.

TV—How It Works. Second Edition. Johnson. New York: John F. Rider Publisher, Inc., 1956. Pp. v+346. $4.60.

The function of this book is to explain the operation of modern TV receivers in the simplest and most direct terms. It is designed for the serviceman, but it will be equally valuable for the TV student and the hobbyist. The only prerequisite for using it is a rudimentary knowledge of electricity and radio circuits.

Organization of the book is intended to satisfy the requirements of a wide range of courses. The mathematical approach is avoided when practical illustrations can be substituted. The text is suitable for home study or for formal school courses.

A large number of illustrations are included, and a number of review questions are provided at the end of each chapter. These questions cover the material in the text.

J. Richard Johnson has had broad practical experience in the field of electronics and considerable experience in teaching.

Forging and Welding. Second Edition. Smith. Bloomington, Ill.: McKnight & McKnight Publishing Co., 1956. Pp. 160. $3.50.

This is the second edition of this book which has been completely revised, and additions have been made which have increased its size by more than 100 percent.

Contents have been arranged into 75 different units, each one dealing with a specific process. Each process is illustrated by excellent pictures or diagrams, and the procedure to be followed in each case is outlined in detail.

Included in the appendix is a great deal of technical information, in tabular form, as well as a few drawings of projects that will appeal to the pupils in forging.

Teachers of forging and welding will find the book an excellent text.

Robert E. Smith is an Emeritus Professor of Education at Ohio State University, Columbus.

Printing for Pleasure. Ryder. Boston: Charles T. Branford Co., 1955. Pp. 142. $2.75.

This book is a primer on printing, and is intended for the amateur who does printing for the pleasure he gets out of it. The book contains a discussion of small presses, the type faces in common use, and how to make impressions.

There is considerable historical material contained in the book. This should increase the interest of the beginning printer in the various styles of type and of printing, as well as in type arrangement.

John Ryder is production manager in a publishing house, and is owner of The Miniature Press.

1956 TV Servicing Information. Beitman, editor. Highland Park, Ill.: Supreme Publications, 1956. Pp. 192. $3.00.

This manual contains diagrams and explanatory material for the various TV designs produced by 13 different companies. This comprehensive coverage makes the manual a valuable aid for the serviceman who has to deal with many different types of TV sets.

While the elementary details of TV are not considered in the book, it will prove to be an excellent reference book in a school-shop library.

Practical Training Manual, Vol. I, Basic Radio. Indianapolis: Howard W. Sams & Co., Inc., 1955. Pp. 240. $5.00.

This is the third printing of a text which was prepared in 1953 to meet the demand on the part of teachers for a simple, yet well-planned manual to be used in the study of radio.

The first section of the manual is divided into 36 lessons, each covering a basic phase of radio study. The second section contains suggested projects which are correlated to the lessons.

This arrangement simplifies the task of the teacher in providing a sequential course, and, at the same time, meet the needs of pupils with varying abilities.

Engineering Drawing and Geometry. Hoelscher and Springer. New York: John Wiley & Sons, Inc., 1956. Pp. vii+497. $8.00.

This book has been designed for use by engineering students and is so organized that

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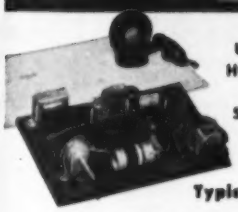

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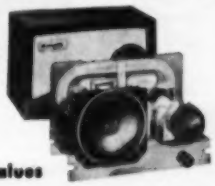

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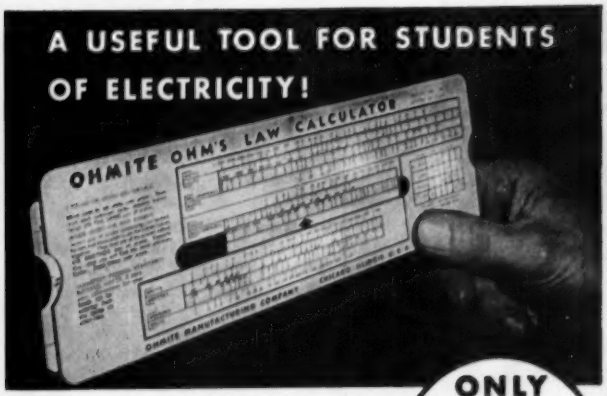

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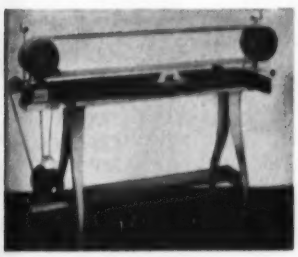

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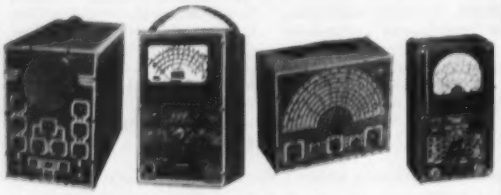

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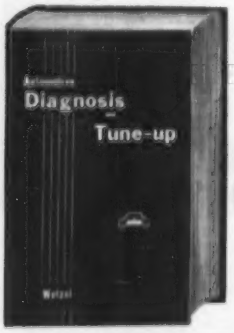

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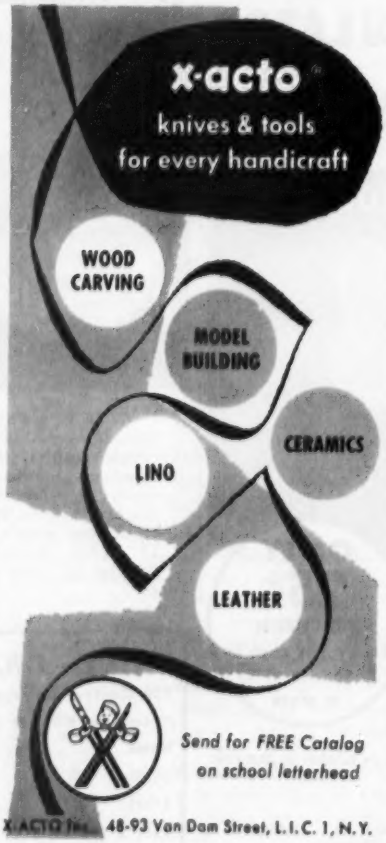

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Randolph P. Hoelscher and Clifford H. Springer are both Professors of Engineering at the University of Illinois.

Pamphlets:

Automotive Electrical Systems, Vol. 1, and Automotive Fuel Systems, Vol. 2, are two technical training manuals published by the Automotive Electric Association. Both are well-illustrated supplements for teaching and both were written with the cooperation of nationally-known industries. Price is $1.00 for each and they may be obtained from the Automotive Electric Association, 16223 Meyers, Detroit 35, Mich.

Better Homes & Gardens Handyman Ideas is a supplement to the book originally published in 1951. Besides the home-improvement projects the booklet includes a 46-page section of home projects which can be built. Price is $1.00 and the booklet may be obtained from Better Homes & Gardens, Meredith Publishing Company, Des Moines 3, Ia.

Audio-Visuals:

A Car Is Born is the title of a new instructional kit issued by the Ford Motor Company and designed for junior- and senior-high-school classes. A teacher's guide is included and the color-illustrated student's manual is augmented by a set of three filmstrips included in the kit. Available from Department of Educational Affairs, Ford Motor Company, Dearborn, Mich.

Putting a Job on the Platen Press, a b and w, sound, 16mm film, shows procedure for inking, putting in form, preparing simple packing, marking for and inserting guides, adjusting for position and impression. It was produced by R. E. Appleton, a graphic-arts instructor in the Burbank, Calif., schools. Running time is 11 minutes. Preview prints are available for evaluation or the complete print is $50, and may be obtained from Bailey Films, Inc., 6509 De Longpre Ave., Hollywood 28, Calif.

Tools of Abundance is a 28-minute, color, sound, 16mm motion picture which deals in story form with the functions of members of America's "production team"—design engineers, process engineers, tool engineers, tool grinders, machine operators, etc. It is available on free loan from the Wesson Company, 1220 Woodward Heights Boulevard, Ferndale 20 (Detroit), Mich.

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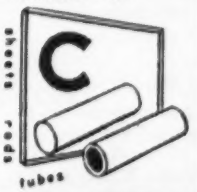

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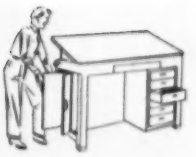

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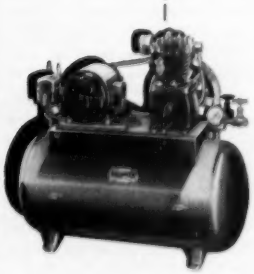

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Drafting and Mechanical Drawing

Space is a 10-minute color film illustrating space and distance concepts in drawing, emphasizing one- and two-point perspective. Price: $100. Bailey Films, Inc., 6509 DeLongpre Ave., Hollywood, Calif.

Graphic Arts

The Art of Photo-Engraving is one of the filmstrips in the "Printing Trades Occupations" series. The charge is $3 for the 45-frame strip. Teaching Aids Service, Visual Education Center Building, Lowell Ave. and Cherry Lane, Floral Park, N.Y.

The Art and Technique of Photoengraving is a 27-minute film offering a running commentary as the procedure unfolds. Free loan. Oscar John, Horan Engraving Co., 44 W. 28th St., New York, N.Y.

Putting a Job on the Platen Press, a b and w, sound, 16mm film showing the procedure for inking, putting in form, preparing simple packing, marking for position and inserting guides, adjusting for position and impression. Time: 11 minutes. Price: $50. Bailey Films, Inc., 6509 DeLongpre Ave., Hollywood 28, Calif.

Wall Chart showing sixteen steps in bookbinding. G. A. Pratt Co., 1108 W. Chicago Ave., East Chicago, Ind.

Machine Shop and Metalworking

Extending the Range of Modern Surface Grinding is a 16mm, sound, color motion picture explaining some phases of surface-grinder application. DoAll Company, Des Plaines, Ill.

Facts About Taps and Tapping is a 16mm film available to metalworking classes covering the function and nomenclature of a tap and its elements. Running time is 26 minutes. Greenfield Tap and Die Corporation, Greenfield, Mass.

A New Turning Calculator which aids selection of lathe feeds and spindle feeds for most rapid turning, also most economical speed. Price: $1. Cincinnati Lathe and Tool Company, Cincinnati 9, Ohio.

Color Slides—150 of them—illustrating the design, features, and application of South Bend lathes, drill presses, shapers, pedestal grinders. Free loan. South Bend Lathe Works, South Bend, Ind.

Do-It-Yourself Aluminum is a 14-minute color film explaining the potential of aluminum as a workshop material. Some finished projects shown, others suggested. Motion Picture Department, Reynolds Metals Company, 2500 South Third St., Louisville 1, Ky.

For Proper Vise Care is an illustrated poster giving four necessary steps. The Columbian Vise & Mfg. Co., 9022 Bessemer Ave., Cleveland, Ohio.

How a Modern Lathe Operates is a wall chart with supplementary folder for student distribution. Free. Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago, Ill.

Metal Spinning is four one-reel, sound, color (or b and w) films covering: tools and materials; fundamental techniques; use of chucks in spinning; deep draws and sectional chuck spinning. Almanac Films, Inc., 516 Fifth Ave., New York 36, New York.

New Horizons in Aluminum Brazing is a 22-minute, black-and-white film covering furnace, torch, and dip brazing of aluminum. Films are available on loan, but borrower pays transportation charges both ways and insurance for loss or damage. Request on school letter at least three weeks in advance, giving size of the film desired—and an advance alternate date. Send requests to Motion Picture Section, Aluminum Company of America, 818 Alcoa Building, Pittsburgh 19, Pa.

Production Band Machining and *Production Tooling* are 16mm films illustrating the latest techniques for slotting, notching, beveling, stock cutting, contour cutting, and third-dimensional cutting. Free-loan basis from DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

Quiz Sheets, 11" x 8½", show a diagram of a lathe with blank spaces for students to identify numbered parts. Package of 100 is $.75. South Bend Lathe Works, South Bend 22, Ind.

The Lathe; *Plain Turning*; and *Grinding Cutter Bits* are three 16mm, sound, color motion pictures, 20 minutes in length, explaining the procedures for using the machines stated in the titles. Free with loaner paying transportation costs. South Bend Lathe Works, South Bend, Ind.

Wall Chart CE777, "Decimal Equivalents." Suitable for framing, 13" x 19". Price is 15c each and the charts are available from South Bend Lathe Works, South Bend 22, Ind.

Wall Chart CE250, "How to Become a Machinist." Suitable for framing, 13" x 22". Price is 15c each and the charts are available from South Bend Lathe Works, South Bend 22, Ind.

Wall Chart CE890, "Principal Parts of a Lathe." Suitable for framing, 21¾" x 17⅝". Price is 15c each and the charts are available from South Bend Lathe Works, South Bend 22, Ind.

Wall Chart. 17 x 22 inches. Also technical looseleaf literature describing various alloy applications in metalworking, foundry, and pattern shop. Cerro de Pasco Corporation, 300 Park Avenue, New York 22, N. Y.

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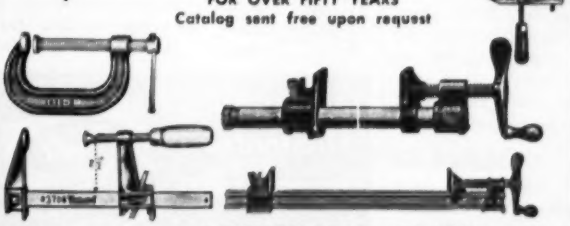

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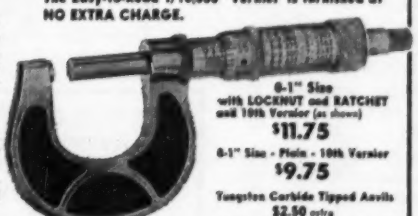

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Full Wall Schematics of AC-DC Five Tube Radio. Available for class use from Dumville Instrument Company, 2416—39th St., N.W., Washington, D.C.

Welding

Eutectic Welding Institute on Records is a two-hour, 33rpm, album, including student manual, instructor's guide, tests, basic study of the welding procedures. $29.50 less school discount. Eutectic Welding Alloys Corp., Flushing 58, N. Y.

New Horizons in Aluminum Brazing is a 22-minute, black-and-white movie covering furnace, torch, and dip brazing of aluminum. Borrower pays transportation both ways plus insurance. Request three weeks in advance. Motion Picture Section, Aluminum Company of America, 818 Alcoa Building, Pittsburgh 19, Pa.

Nothing but the Best is a 20-minute movie demonstrating Airco's tungsten inert-gas arc-welding process. Color, sound. Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

The Guy Behind Your Back is a 20-minute Airco sound-slide film showing safe practices with welding and cutting apparatus. Air Reduction, 60 E. 42nd St., New York 17, N. Y.

Woodworking

Chisels and Gouges is an 11-minute, black-and-white movie explaining some basic safety problems and principles for the woodworking shop. It is appropriate for secondary schools. Young America Films, Inc., 18 E. 41st St., New York 17, N. Y.

Claw Hammer and Nail Set; Hand Saws, Crosscut and Rip; The Hand Plane are 11-, 11-, and 12-minute films, respectively, for use in seventh through tenth grades. $100 each in color, or $50 each in black and white. Tompkins Films, 960½ Larrabee St., Los Angeles, Calif.

Coming Out of the Woods is a 16mm, sound-color movie dealing with lumber and wood product research. Available on a free-loan basis from The Bray Studios, Inc., 729 Seventh Ave., New York 19, N. Y.

Diagramed instruction page, form 67, for building and using your own veneer press. Adjustable Clamp Co., 405 N. Ashland Ave., Chicago 22, Ill.

Industrial-Arts Training Folder is a 29-page file of illustrated data sheets on the use of redwood in the shop. Free. California Redwood Association, 576 Sacramento St., San Francisco 11, Calif.

Machine Demonstration Film presents woodworking functions of DeWalt's multi-purpose radial-arm-type woodworking machinery. For group showings contact DeWalt, Inc., Fountain Ave., Lancaster, Pa.

New Approach to Saw Guarding is a 16mm film which demonstrates safety. Running time is 15 minutes and the film is available on loan from Brett-Guard Company, 5 W. Sheffield Ave., Englewood, N. J.

Power Woodworking Tools are a series of seven 16mm, sound and color films dealing with use of a power tool: saw, sander, lathe,

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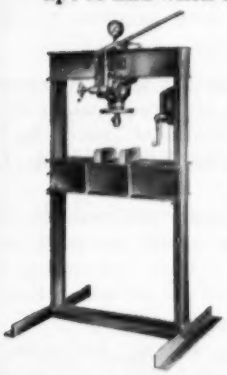

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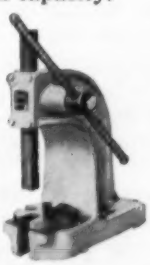

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29 Small Project Plans is complete with dimensional drawings for woodworking, bills of materials, step-by-step instructions. Fifty cents per copy from Clausing Division, Atlas Press Company, 19122 N. Pitcher St., Kalamazoo, Mich.

Miscellaneous

Analysis Techniques for Instructors is a 61-frame, two-part filmstrip using woodworking, auto mechanics, machine shop, fly tying, swimming, and television repair to demonstrate the analysis technique. The $3.50 cost includes mailing charges. John A. Jarvis, Stout State College, Menomonie, Wisconsin.

At This Moment is a 26-minute sound and color film on modern railroad progress. Association Films, Inc., in Ridgefield, N. J. (Broad at Elm); Chicago (79 E. Adams St.); Dallas (1108 Jackson St.); and San Francisco (351 Turk St.).

A Car is Born is the title of a new instructional kit issued by the Ford Motor Company and designed for junior- and senior-high school classes. Includes three filmstrips and teacher's guide. Department of Educational Affairs, Ford Motor Company, Dearborn, Michigan.

A Way of Thinking is a 15-minute, 16mm full color and sound film showing plant modernization and how to combat obsolescence. Free loan from Cincinnati Lathe and Tool Company, Cincinnati 9, Ohio.

Chemistry of Steel is a color filmstrip dealing with the science of iron and steel making. One copy free to each school system on request. Teaching suggestions booklet also free in reasonable quantities. American Iron and Steel Institute, 350 Fifth Ave., New York, N. Y.

Chit Chat is the title of a monthly newsletter offering craft information to teachers. Available from Craft Service, 337 University Ave., Rochester 7, N. Y.

Elmer's Glue Chart lists uses of the right glues to the right materials. Gluing properties required are given. The Borden Company, Chemical Division, 350 Madison Ave., New York 17, N. Y.

Glass and You shows the contributions of glass to culture. It is 16mm and covers 75 centuries in time including the creation of the 200" Mt. Palomar telescopic mirror. Free-loan basis, user paying postage. Association Films in Ridgefield, N. J. (Broad at Elm); Chicago (79 E. Adams St.); Dallas (1108 Jackson St.), and San Francisco (351 Turk St.).

Have a Hobby is a 16mm film demonstrating plastic-model assembling. The movie runs 13 minutes. Free. Monsanto Chemical Company, Plastics Divisions, Springfield, Mass.

Methods of Teaching Industrial Subjects is a filmstrip enumerating the commonly accepted methods of teaching industrial subjects. Narration is 15 minutes and is available on record or tape. The 52-frame strip costs $22.50. Industrial Education Department, Division of Extension, University of Texas, Austin.

Sound Films Catalog, a 36-page booklet, offering full information on 16mm, sound movies in color and black and white, and slidefilms loaned at no charge. Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.

The Art of Leathercarving is a 16mm, color movie showing how to carve leather for pleasure or for extra income. Free loan from any Tandy Leather Company store or the firm's offices at 300 Throckmorton St., Ft. Worth, Tex.

The Structure of Unions is an 11-minute, black-and-white or color cartoon examining the organization of labor unions today. Black and white: $50. Color: $110. McGraw-Hill Text-Film Department, 330 W. 42nd Street, New York, N. Y.

The Technique of Internal Carving is a leaflet giving instruction on plastic carvings. Available in quantities from D. W. Cope Plastics, 11640 Bellefontaine Road, St. Louis 15, Mo.

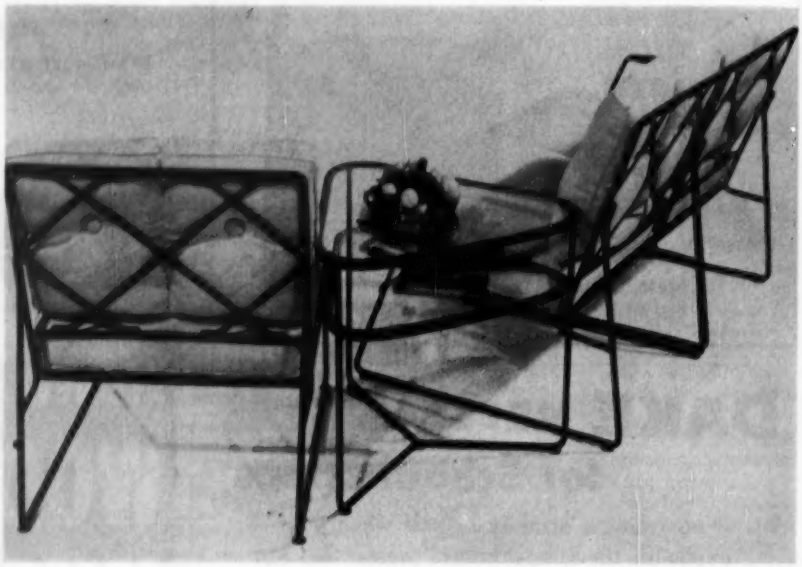
To Enrich Mankind is a 25-minute, color motion picture explaining the significance of the mechanical engineer in the development of the United States. Free loan to schools. Barbara A. Brown, Public Relations Department, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Tools of Abundance is a 28-minute, color, sound, 16mm movie dealing with those who guide production in the United States. Free on loan basis. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

Working with Light gives 12 projects which teach good design and good lighting. The handbook is $1.00, projects are $.05 each. Better Light Better Sight Bureau, 420 Lexington Ave., New York 17, N. Y.

Project Design

What the industrial designers are doing (one of a series)



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Designer: MAURIZIO TEMPESTINI
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The Italian designer Tempestini is the man with the pencil (and probably the welding torch) behind the pieces illustrated above. The interesting wedge table is 22½" high. With a special "Neva-Rust" finish, rust cannot touch the furniture for ten years. The sectionals are armless and feature an unusual sled base. — *Robert A. Tinkham, Assistant Professor of Industrial Education, University of Illinois, Urbana.* ★

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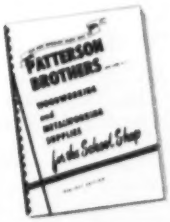

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U. S. Office of Education Vocational Education Division Washington 25, D. C.

James H. Pearson, assistant commissioner and assistant director for vocational education.
Ward P. Beard, assistant director.

Trade and Industrial Education Branch

John P. Walsh, director.
———, assistant director.
Walter H. Cooper, program specialist, Central region.
———, program specialist, Pacific region.
William P. Loomis, program specialist, North Atlantic region.
Edward G. Ludtke, program specialist, Southern region.
Allen T. Hamilton, research specialist.
———, specialist, training for girls and women.
Howard K. Hogan, consultant, employer-employe relations.
Silas M. Ransopher, specialist.

Secondary Education

DeWitt Hunt, industrial-arts specialist.

Alabama

R. E. Cammack, director, vocational education, Montgomery 4.
J. C. Cannon, supervisor, agricultural education, Montgomery 4.
J. F. Ingram, supervisor, trade and industrial education, Montgomery 4.

Alaska

Howard M. Matthews, director, vocational education, department of education, Juneau.

Arizona

J. R. Cullison, director, vocational education and supervisor, agricultural education, Phoenix.
Louis A. McElroy, supervisor, trade and industrial education, Phoenix.

Arkansas

J. Marion Adams, assistant commissioner for vocational education, Little Rock.
J. C. Ruppert, supervisor, trade and industrial education, Little Rock.
George F. Sullards, supervisor, agricultural education, Little Rock.

California

Wesley P. Smith, director, vocational education, Sacramento 14.
B. J. McMahon, chief, bureau of agricultural education, Sacramento 14.
Samuel L. Fick, chief, bureau of industrial education, Sacramento 14.
Gail E. Moore, supervisor, trade and industrial teacher training, University of California, Berkeley 4.
Melvin L. Barlow, supervisor, trade and industrial teacher training, University of California, Los Angeles 24.
Lee D. Bodkin, assistant supervisor, trade and industrial teacher training, University of California, Los Angeles 24.
Van B. Lawrence, regional supervisor, bureau of trade and industrial education, Sacramento 14.
Paul Lofgren, assistant supervisor, trade and industrial teacher training, University of California, Berkeley 4.
G. L. Rosecrans, supervisor in charge of apprentice training, 2082 Center St., Berkeley.
Mack Stoker, regional supervisor, bureau of trade and industrial education, Room 809-J, California State Bldg., Los Angeles.
Ernest G. Kramer, assistant supervisor, bureau of industrial education, Sacramento 14.
Sidney E. McGaw, regional supervisor, bureau of trade and industrial education, 2082 Center St., Berkeley.
Richard S. Nelson, special supervisor, bureau of trade and industrial education, Room 809-J, California State Bldg., Los Angeles.
Wallace Theilmann, supervisor, instructional materials program, Sacramento 14.
Robert L. Woodward, consultant in industrial-arts education, Sacramento 14.
Karl Thomte, assistant supervisor, trade and industrial teacher training, University of California, Berkeley 4.

Colorado

A. R. Bunger, director, vocational education, Denver.
W. G. Flannery, supervisor, trade and industrial education, Denver.
M. G. Linson, supervisor, agricultural education, Denver.

Connecticut

Emmett O'Brien, director, division of vocational services, Hartford 15.
G. Wesley Ketcham, consultant, industrial arts, Hartford 15.
Walter Jacoby, consultant, agricultural education, Hartford 15.
R. W. Howes, chief, bureau of vocational education, Hartford 15.
Anna C. Moore, consultant, vocational school general education and libraries, Hartford 15.
Joseph T. Nerden, consultant, trade and industrial education, Hartford 15.
Laurence W. Eddy, consultant, trade and industrial teacher training, Hartford 15.
Joseph Murphy, consultant, audio-visual education, Hartford 15.
Gordon Harrington, consultant, research in vocational education, Hartford 15.
Ralph Kiersted, consultant, vocational school mathematics and science, Hartford 15.

Delaware

R. W. Heim, assistant superintendent for vocational education, 313 S. State St., Dover.
A. B. Anderson, director, trade and industrial education, 511 W. Eighth St., Wilmington 43.
Frank M. Forstburg, supervisor, trades and industries in charge of foreman training, 511 W. Eighth St., Wilmington 43.
W. Lyle Mowlds, director, agricultural education, 313 S. State St., Dover.
William J. Schott, supervisor, trade and industrial education in charge of teacher training, 511 W. Eighth St., Wilmington 43.

District of Columbia

F. A. Gregory, assistant superintendent, industrial education, Franklin Administration Bldg., Washington 5.
Harold A. Clark, director, industrial education, Wormley School, 3331 Prospect Ave., N.W., Washington 7.
J. O. Snowden, supervising director, trade and industrial education, Wormley School, 3331 Prospect Ave., N.W., Washington 7.
J. E. Zearfoss, supervising director, industrial arts, Wormley School, 3331 Prospect Ave., N.W., Washington 7.
W. H. Payne, supervising director, industrial arts, Wormley School, 3331 Prospect Ave., N.W., Washington 7.
P. J. Rayford, supervising director, agricultural education, Woodrow Wilson High School, Nebraska Ave. & Chesapeake St., N.W., Washington 16.

Florida

Walter R. Williams, Jr., director, vocational and adult education, Tallahassee.
Harry E. Wood, supervisor, agricultural education, Tallahassee.
H. F. Hinton, supervisor, trade and industrial education, Tallahassee.
E. A. Emmelhainz, supervisor, trade and industrial education, Tallahassee.
E. B. Heiny, supervisor, trade and industrial education, Tampa.
T. J. Bailey, supervisor, trade and industrial education, Daytona Beach.
Edwin L. Kurth, consultant, industrial arts, Tallahassee.
J. Doughman, trade and industrial teacher trainer, University of Florida, Gainesville.
B. J. Nelms, trade and industrial teacher

trainer, University of Florida, Gainesville.
J. W. Struck, trade and industrial teacher trainer, Florida State University, Tallahassee.
W. L. Lightsey, coordinator, labor-management conference training, Lutz.

Georgia

George I. Martin, director, vocational education, Atlanta 3.
T. G. Walters, supervisor, agricultural education, Atlanta 3.
W. M. Hicks, supervisor, trade and industrial education, Atlanta 3.
G. F. Mulling, assistant supervisor, trade and industrial education, Atlanta 3.

Hawaii

W. H. Coulter, deputy superintendent, division of vocational education, Box 2360, Honolulu 4.
C. R. Ferdun, director, agricultural education, Box 2360, Honolulu 4.
Albert J. Feirer, director, trade and industrial education, Box 2360, Honolulu 4.
Lucian J. Paulus, assistant director, trade and industrial education, Box 2360, Honolulu 4.

Idaho

George E. Denman, director, vocational education, Boise.
S. R. Glenn, supervisor, trade and industrial education, Boise.
J. E. Marmon, assistant supervisor, trade and industrial education, Boise.
Emory M. Howard, supervisor, agricultural education, Boise.

Illinois

J. E. Hill, director, vocational education and chief, agricultural education, Springfield.
Edward M. Claude, chief, trade and industrial education, Springfield.
S. James Senes, supervisor, trade and industrial education, Chicago.
Walter J. Bartz, supervisor, trade and industrial education, Springfield.
H. A. Meinert, supervisor, trade and industrial education, Springfield.
Fred W. Swan, supervisor, trade and industrial education, Springfield.
M. Wittevrongel, supervisor, trade and industrial education, Springfield.
L. L. Wingo, supervisor, trade and industrial education, Springfield.
Amos D. Coleman, supervisor, industrial arts, Springfield.
John W. Walgren, supervisor, industrial arts, Springfield.
Eurus Stoltz, supervisor, trade and industrial education, Springfield.
Rupert N. Evans, trade and industrial teacher trainer, University of Illinois, Urbana.
Keith Humble, industrial education teacher trainer, University of Illinois, Urbana.
M. Ray Karnes, industrial education teacher trainer, University of Illinois, Urbana.

Indiana

Wilbur Young, superintendent of public instruction and director, vocational education, Indianapolis 4.
W. A. Williams, administrative assistant and acting director, vocational education, Indianapolis 4.
Harold Taylor, supervisor, agricultural education, Indianapolis 4.
H. C. McComb, supervisor, trade and industrial education and distributive education, Indianapolis 4.
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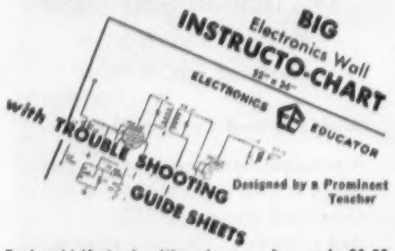

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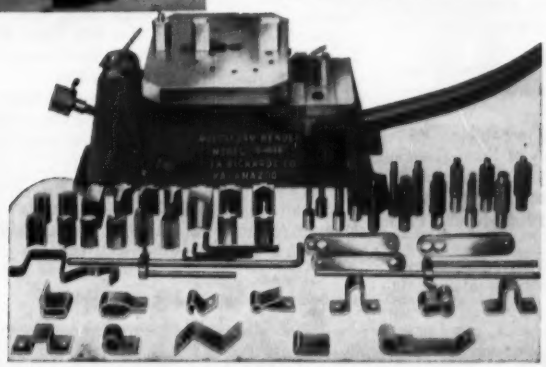

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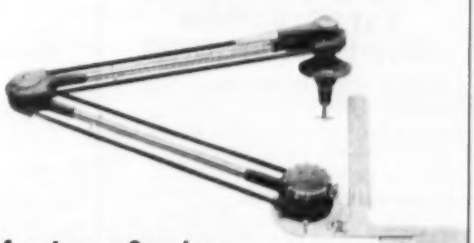

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Seymour T. Brantner, trade and industrial teacher trainer, Pennsylvania State University, State College.
Walter B. Jones, director, vocational teacher education, University of Pennsylvania, Philadelphia.
Richard W. Hartmann, trade and industrial teacher trainer, University of Pennsylvania, Philadelphia.
———, trade and industrial teacher trainer, University of Pennsylvania, Philadelphia.
Ralph K. Beamer, trade and industrial teacher trainer, University of Pittsburgh, Pittsburgh.
Charles P. Scott, director, vocational teacher education, University of Pittsburgh, Pittsburgh.

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Fernando Roca, assistant director, board for vocational education, Box 652, Hato Rey.
Antonio Figueroa Colón, supervisor, trade and industrial education, Box 652, Hato Rey.
Rafael Muller, acting supervisor, agricultural education, Box 652, Hato Rey.
Angel Ginorio Gorbea, teacher trainer, trade and industrial education, Box 652, Hato Rey.
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Angel Luis Alicea, assistant supervisor, trade and industrial education, Box 652, Hato Rey.
Emilio Arill, assistant supervisor, trade and industrial education, Box 652, Hato Rey.
Juan G. Rivera, assistant supervisor, trade and industrial education, Box 652, Hato Rey.
Salvador Baigés, supervisor, vocational training for veterans, Box 652, Hato Rey.
Ramón Iglesias, assistant supervisor, trade and industrial education, Box 652, Hato Rey.
Ferdinand Rossy, supervisor, industrial-arts education, Box 652, Hato Rey.
Sancho Domínguez, assistant supervisor, industrial-arts education, Box 652, Hato Rey.
Jorge Machuca, assistant supervisor, industrial-arts education, Box 652, Hato Rey.
Francisco R. Núñez, assistant supervisor, industrial-arts education, Box 652, Hato Rey.
Julio Quiñones, assistant supervisor, industrial-arts education, Box 652, Hato Rey.
Aníbal Sepúlveda, assistant supervisor, industrial-arts education, Box 652, Hato Rey.
Manuel A. Hernández, teacher trainer, industrial-arts education, Box 652, Hato Rey.

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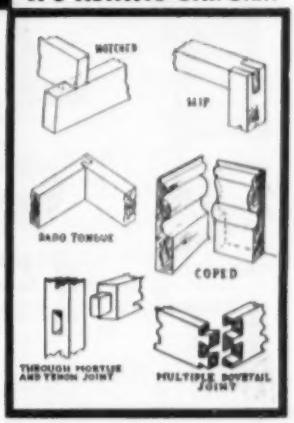

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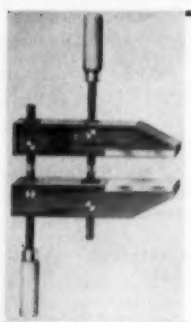

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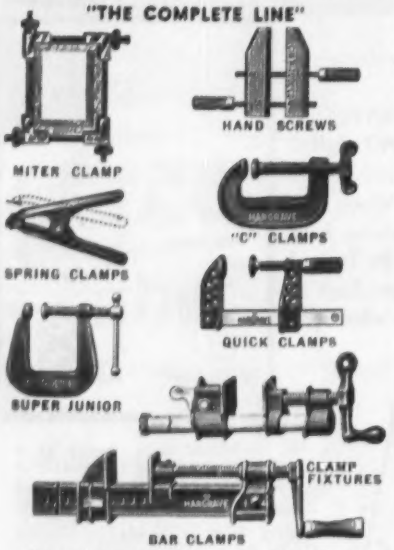

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news from Industry

(Circle the numbers on the card in this issue to secure the items listed.)

New Di-Acro Plastic Press

A new plastic press which performs three dimensional forming operations in thermoplastic sheet materials up to 18" square has been announced by O'Neil-Irwin Mfg. Company. The press uses the principles of mechanical stretch forming, vacuum forming, and blow forming.

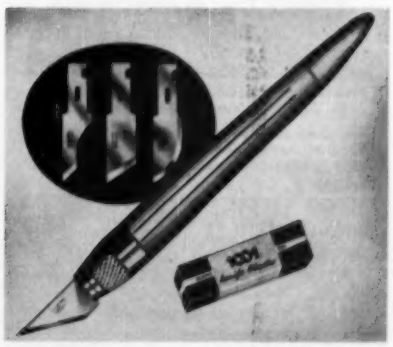
Two models of the press are available. Di-Acro Plastic Press No. 1 is capable of stretch forming only. It can be converted into a blow forming press if a source of air pressure is available in the shop.

Di-Acro Plastic Press Model No. 18 has a motor driven vacuum-pressure pump which makes it possible to perform both vacuum and blow forming in addition to stretch forming. Change-over time from one operation to another takes only a few minutes, the company states, and the same forming mold can often be used for both vacuum forming and blow forming.

The platen of the press is raised and lowered by a screw action on the center column. Four guide posts on the corners keep the press in alignment. Maximum draw of plastic sheet material is 8".

For more information write the O'Neil-Irwin Manufacturing Company, Lake City, Minn., mentioning SCHOOL SHOP; or *circle no. A-1 on the business-reply card.*

Tool Knife Has Lock-in Feature

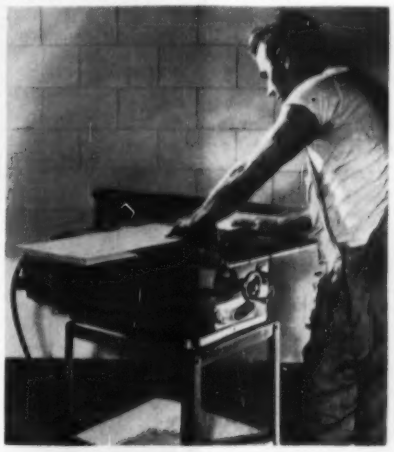


R. Murphy Company's new "1001" all-purpose reblade knife is designed for easy and exact whittling, chiseling, or cutting. Light in weight, the new knife has tempered surgical steel blades.

The company asserts that an exclusive feature of the knife is a chuck in the handle that locks the blade in place, said to be the only reblade knife with this patented device.

For more information write R. Murphy Company, Ayer, Mass., mentioning SCHOOL SHOP; or *circle no. A-2 on the business-reply card.*

Delta Introduces New Saw

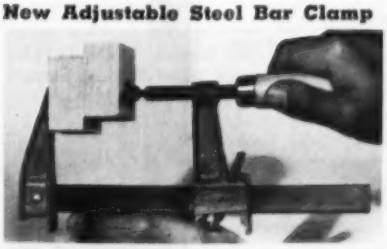


A new bench model tilting arbor 10" circular saw has been introduced by the Delta Power Tool Division of Rockwell Manufacturing Company.

The new tool, which replaces the Delta 10" tilting table saw, cuts stock up to 3⅛". It weighs slightly over 200 pounds and is operated by a one hp motor. Low-priced, the saw is readily adaptable for use in combination with the new Delta 6" long-bed jointer introduced in 1954. The company announces that the two machines will be teamed up in a new combination tool to be introduced later this year.

For more information write the company, 443 North Lexington Ave., Pittsburgh 8, Pa., mentioning SCHOOL SHOP; or *circle no. A-3 on the business-reply card.*

New Adjustable Steel Bar Clamp



The new Style No. 37 Jorgensen steel bar clamp, recently announced by Adjustable Clamp Company, features lightness in weight and the new design extended multiple-disc clutch for easy and convenient release after clamping.

The manufacturer states that finger pressure on the clutch, either above or below the clamp bar, releases the sliding head for instant adjustment. The clutch grips the bar automatically any place on the bar, is simple and foolproof in construction.

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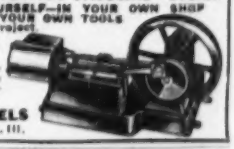

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Capacities of the new clamp range from 6" to 24". All sizes reach 2½" from the bar.

For more information write Adjustable Clamp Company, 405 N. Ashland Ave., Chicago 22, Ill., mentioning SCHOOL SHOP; *or circle no. A-4 on the business-reply card.*

New Gas-Fired Forge Announced by Champion

A new gas-fired forge manufactured by Champion Blower & Forge Company, is now available. It is especially suitable for use in school shops, the company asserts.

The maker claims the forge requires little, if any, attention, does not involve the disposal of ashes, and is ready to use by turning on the blower switch and lighting the gas. The manufacturer also states that the forge is especially adaptable for working in a closed building where smoke and excessive fumes would be objectionable.

According to the firm, the forge is equipped with a solenoid safety valve so that when the the motor is turned on, the valve opens, permitting the gas to enter the forge, thus preventing any backfiring or damage to the blower unit. Also, the blower must be in operation before the solenoid valve will allow the passing of gas to the mixing chamber in the blower.

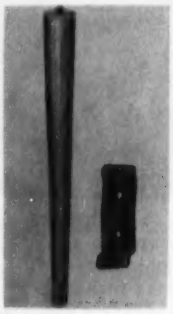
Specifications state that the forge hearth is heavy-steel construction lined with high-temperature, heat-resisting cement.

The forge comes complete with electric blower for 115v, 60c, 1 phase, ⅛ hp motor with switch cord and plug and ¾" solenoid safety gas valve.

For more information write to the Champion Blower & Forge Co., Lancaster, Pa., mentioning SCHOOL SHOP; or *circle no. A-5 on the business-reply card.*

Dennix Expands Line of Hardwood Legs

Do-it-yourself legs of northern hardwood by Dennix Products Company are now available in seven sizes, the company has announced.



All legs come with a patented steel bracket for interchangeable straight or flare-leg mounting, according to the manufacturer. They are available in the following lengths: 6", 9", 12", 16", 18", 22", and 28" sizes. Model TW legs, for heavy furniture, come in 16", 22", and 28" sizes, the firm says.

It is suggested that Dennix legs are particularly suitable for functional tables made with plywood faced with some kind of synthetic resin veneers. The manufacturer also suggests that old furniture can be modernized quickly with these legs. The legs are sanded, ready for finish with harmonizing stains or matching solid colors.

Additional information can be had by writing to the Dennix Products Co., 78 Fifth Ave., New York 11, N.Y., mentioning SCHOOL SHOP; *or by circling no. A-6 on the business-reply card.*

New Drill-Point Gage Eliminates Guesswork

A new, precision, four-way drill-point gage made by the Swanson Manufacturing Company will enable students to measure the chisel, the point angle, and the clearance angle in a few seconds, according to the manufacturer.

Drill sharpening is made more accurate, breakage is reduced, and the selection of the right drill for various metals and materials is made easier and faster, it is said.

The gage, made of stainless steel, is in the form of two semicircular discs held together at the center by a pivot. The bottom disc is 4" in diameter and contains 1° calibrations along the rim for measuring chisel point angles from 110° to 135°; point angles from 40° to 90°; and clearance angles from 0° to 20°.

The top semicircular disc, 3¾" in diameter,

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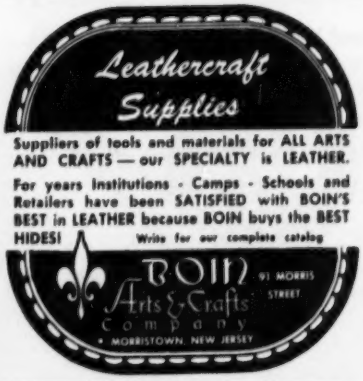
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contains a point center scale and explanatory illustrations.

For more information write to the Swanson Mfg. Co., 1236 Sherman Ave., Evanston, Ill., mentioning SCHOOL SHOP; or *circle no. A-7 on the business-reply card.*

Improved Corner Clamp Announced by Gunver

A corner clamp permitting the user to correct errors in mitered corner cuts has been announced by the Gunver Manufacturing Company.

The maker says the clamp uses two thumbscrews and a specially channeled section in the right-angle corner which allows a saw to correct any errors which might have been made in making a miter cut. The back of the clamp has openings for fastening with glue or patented fasteners.

Gunver says the new clamp is press-formed from heavy-gage, cold-rolled steel which is cadmium plated to resist rust and corrosion. In addition, Gunver states, the clamp has a 2" capacity for square and molding stock used in making picture frames, window screens, etc., but will handle corners made with materials having different widths and thicknesses.

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More information can be had by writing to the Gunver Mfg. Co., Hartford Rd., Manchester, Conn., mentioning SCHOOL SHOP; *or by circling no. A-8 on the business-reply card.*

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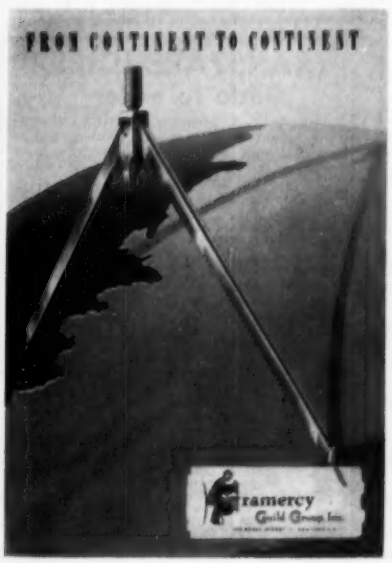
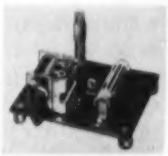


Allied Announces Transistor Kit



A transistor radio kit package for the student, experimenter or beginner in electronics has been announced by Allied Radio Corporation.

It delivers loud, crisp headphone reception of the standard broadcast band, according to the manufacturer, and features a printed-circuit component mounting board. Soldering is reduced to only a few connections. Operating power is supplied by a single, penlite-type battery. Since no tubes are used, the battery should hold up for a considerable time, it is said.

Additional information can be had by writing Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill., mentioning SCHOOL SHOP; *or circle no. A-9 on the business-reply card.*

New Literature:

The 1956 Reference Guide to Dow Corning Silicone Products describes almost 150 of the most generally used silicone products, 18 of which were first introduced within the last 12 months. The products are grouped in the 12-page brochure by physical form and cross-indexed by usage, enabling them to be located by what they do as well as by what they are. For a copy write the Dow Corning Corporation, Midland, Mich., mentioning SCHOOL SHOP; or *circle no. A-10 on the business-reply card.*

Catalog A-55 is a new eight-page catalog published by Tree Tool and Die Works on the two UV Vertical Milling Machine. For a copy write the company, 1600 Junction Ave., Racine, Wis., mentioning SCHOOL SHOP; or *circle no. A-11 on the business-reply card.*

Giles and Kendall Company's price list is a 12-page, four-color catalog illustrating, describing, and listing the prices of do-it-yourself items ranging from student desks to full suites of bedroom furniture. Included are listings of finishing materials, a cedar humidifying agent, and a mail-order blank. The catalog may be had by writing to the Giles & Kendall Co., Huntsville, Ala., mentioning SCHOOL SHOP; *or by circling no. A-12 on the business-reply card.*

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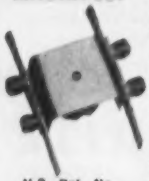

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Washington ..... *from page 123*

weeks. The official reason is that its members are trying to decide under what rules to bring the bill to the floor of the House for a vote. They know that if the measure is placed before the House under a rule which permits amendments there is trouble ahead. Representative Adam Powell (D., N.Y.) is all set to introduce his dynamite-laden amendment which would deny federal dollars to those states or local communities which keep Negro and white pupils apart in public schools. Should this amendment be placed before the Congressmen, a majority (consisting of northern and western Republicans and Democrats) will approve it. Observers are convinced that this will be the final blow to school construction aid. For, immediately after the amendment is tacked on to the measure, a bloc of southern Congressmen will strangle the measure.

Predictions freely circulate here that the school construction measure is dead for 1956. And because federal aid will thus be denied to local communities, boards of education will be more hard pressed than ever for resources. Both general education and vocational offerings are likely to suffer. The reason for this was suggested by M. D. Mobley, executive secretary, American Vocational Association. Mr. Mobley says, "In attempting to build school houses fast enough to house the ever-increasing number of students, and to employ instructors to teach them, there has developed competition for the educational dollar such as we have never experienced in our lifetime. This, of course, has militated against the development of elementary and regular high schools. People are concerned first with elementary and secondary schools. If money is left after these needs have been met, they will then provide funds for vocational education."

Federal aiders are gloomy, but not depressed. At least, they see some good in the present dark situation. James McCaskill, NEA legislative head, points to one of these beneficial aspects. "We're keeping the enemies of increased aid to education so busy in Washington, they don't have time to fight you folks at home." This wry observation has a bit of a story. Dr. McCaskill's office has been able to identify by name and address the persons and organizations now fighting in Washington *any* bills seeking more money for schools. He went a step further. He asked: "Are these organizations (mostly organized taxpayers) opposed only to federal aid? If so, do they

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support increased funds for schools from state and local sources?" A bit of research gave the answer. "The taxpayers' associations," Dr. McCaskill claims, "have blocked help for education not only from Washington, but from their own state and local treasuries. And so, by engaging the enemies of education on Capital Hill," reasons Dr. McCaskill, "the NEA is aiding the friends of education in the states."

Segregation and Vocational Funds.—But let's return to the segregation question, at least long enough to listen to the views of Rep. Lee Metcalf (Montana), because they affect vocational education. Mr. Metcalf is a constitutional lawyer and has served on the Supreme Court of his state. He believes that once the United States Supreme Court has spoken on an issue, that opinion becomes a part of the Constitution. And, he argues, it is the duty of the executive branch to enforce the Constitution without further action from Congress. For that reason, Mr. Metcalf is opposed to the Powell amendment (he thinks it unnecessary). But he insists that the Commissioner of Education should immediately stop vocational-education funds to those states which have "openly, notoriously, and publicly declared they are not going to comply with the Supreme Court decision."

Question: Which states does Mr. Metcalf have in mind?

"Those few states which have by a system of calculated disobedience taken official and legal steps to defy the Supreme Court decision."

Question: How many states have done so?

"Virginia has approved a referendum to evade integration. Georgia and a few other states have either passed resolutions, enacted state provisions, or have issued official proclamations designed to nullify the Supreme Court decision. The United States must take cognizance of these actions, and where they occurred, the Commissioner of Education must withhold vocational-education funds as

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well as funds for other federal school programs."

More USOE Services?—As for the Office of Education budget, the goal is big—a doubling of operating expenses for 1957, from $2 to $6 million. A large chunk of that sum would go for research. U.S. Commissioner of Education Sam Brownell would like to concentrate on some eight or ten projects—what education can do about the gifted child, the mentally retarded, juvenile delinquency; how education can help the low-income family; and what needs to be done to meet the challenges of civil defense, television, automation, the coming waves of new college students, and the shortages of teachers. Concerning the one item of direct interest to vocational educators, Dr. Brownell spoke these sparse words: "We want to consider the implications of expanding technology on vocational education."

It is quite likely that the Office of Education will try to be of greater service to state departments of education, should Congress approve the money. Dr. Brownell has intimated that he will ask each state department of education what additional services and resources it needs or could use from Washington. After these facts are in, the Office will try to set up machinery (probably by 1958) to satisfy the requests each state has made.

As for industrial arts—no research project is proposed here. The most helpful thing one federal official said was this: "In our study of juvenile delinquency, the gifted child, or the mentally retarded, we may find that industrial arts has a role to play. We shall not overlook the contributions that this phase of the curriculum could make to the solution of any widespread problem existing amidst our children and youth."

Few people expect that Congress will approve the entire sum the Office of Education is asking. But many observers are confident that Congress will give the Office of Education more money than it has had last year.

Full Vocational Funds Asked.—Behind closed doors, the House Appropriations subcommittee heard two vocational-education leaders plead for more money. AVA President J. Fred Ingram and AVA Executive Secretary M. D. Mobley said in the strongest words at their command it is time Congress approved the full amount authorized by the George-Barden Act, that is, $29.3 million.

President Ingram based his plea on recent information that came to him

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from the states. A short time ago, the AVA asked each state director of vocational education three questions: (1) How many additional teachers do you need? (2) How much would it cost to hire them? (3) How many federal dollars would be needed for this purpose? The tabulation showed that state officials believe their schools need 23,309 additional vocational teachers; that it would take $113.5 million to hire them; and that the federal share based on the present percent today from federal funds would total an additional $27.8 million.

But the two vocational leaders did not ask for that sum. They requested only the additional sum of $2.8 million. This relatively small sum is all that is required at present to bring the total of federal vocational funds up to the amount authorized by Congress. Mr. Ingram said, "There is no question but that this increase is greatly needed. Such action would result in making vocational education available to additional people who need and can profit by vocational training. It would promote the general welfare among the masses and help to provide greater security for the nation."

Dr. Mobley, in his testimony, stressed that the United States is far behind Russia in its concern for technical and vocational education. He said, "There is much evidence that Russia is trying desperately, through the expansion of engineering, scientific, technical, and vocational training programs, to increase production and thus place itself in a strong position to eventually compete with us and the rest of the free nations for the markets of the world." Dr. Mobley told the appropriations subgroup that there has taken place a tremendous expansion of vocational and technical training in Russia. "Especially has Russia increased its training program for technicians who serve in positions between professional engineers and skilled workers." He ended by asking not only that the full amount will be appropriated for fiscal 1957, but that the restrictive language limiting the amount for distributive education will be deleted. "Unless this language is deleted, the full amount cannot, according to law, be appropriated," he said.

Because of these strong pleas, and because of the relatively small amount involved, the chances for getting the full $29.3 million for the first time appear good.

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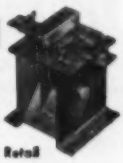

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from Washington

by Michael Paca

Construction Aid Dying.—Congress is acting on legislation more expeditiously this year than last (this being an election year). But this is true only of noneducational measures. The progress on most school legislation is slow and the outcome still uncertain as this letter goes to press. The three major items of interest here are (1) the school construction bill, (2) the 1957 Office of Education budget, and (3) the 1957 vocational-education appropriation.

The school construction bill is in trouble. Like previous federal aid bills, this measure was quickly overwhelmed by a controversy which seems to mean its death. In previous years, the controversy has usually been the question whether federal money should go for Catholic pupil services. This year the controversy is whether federal funds shall go to states which practice segregation.

It is a perplexing and explosive question, which as we shall see, touches not only school construction, but also vocational education.

At this moment, the House Rules Committee is holding back the bill. It may not be released for debate for

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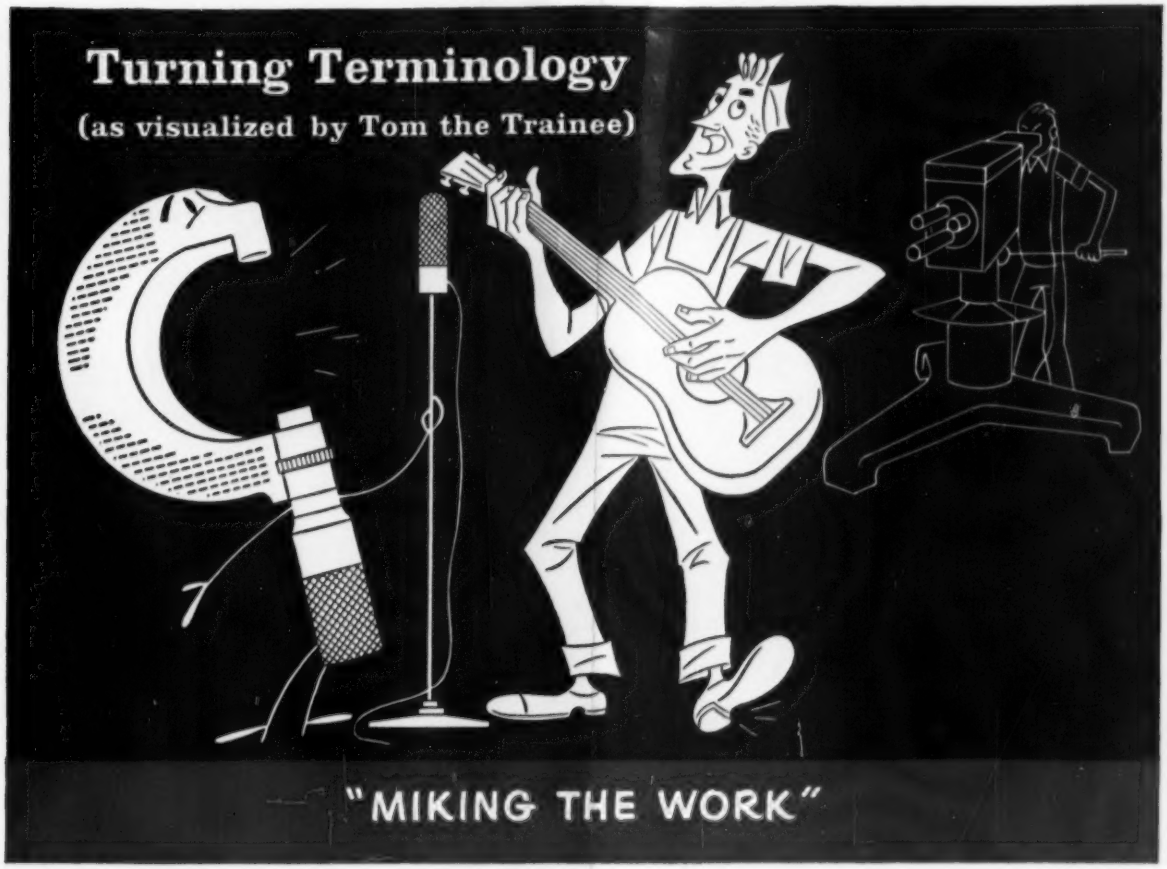

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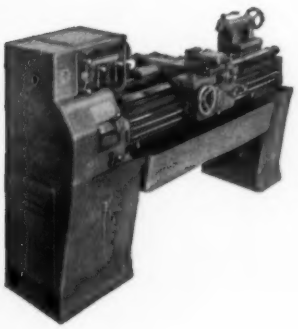

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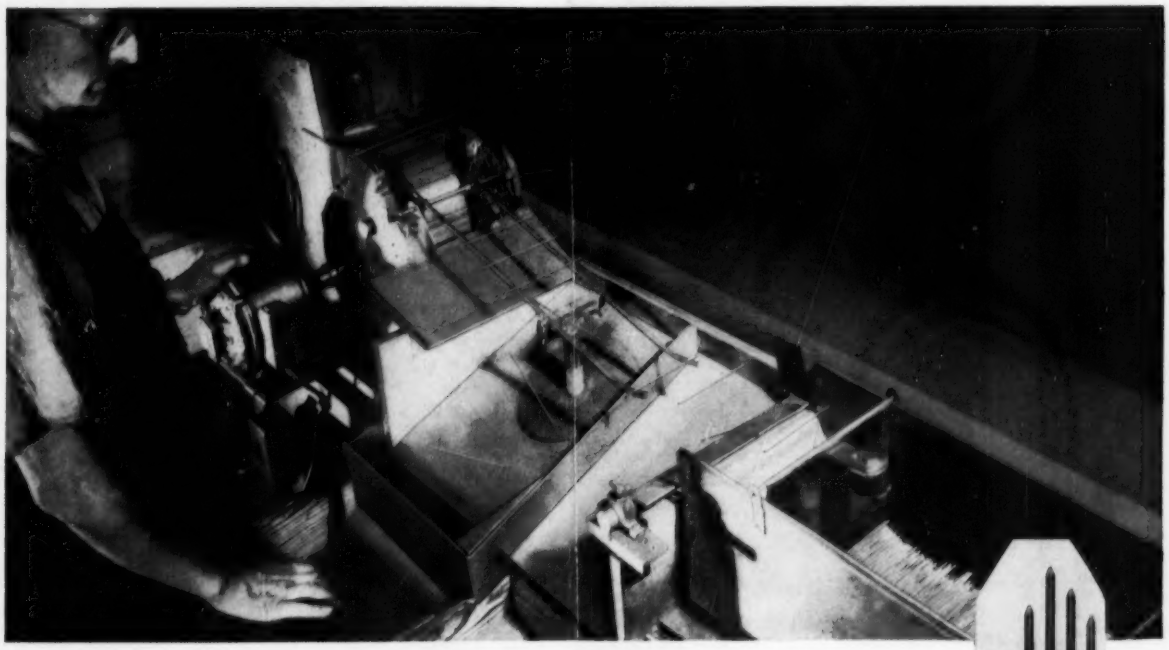

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